US008890384B2

(12) **United States Patent**
Burton et al.

(10) **Patent No.: US 8,890,384 B2**
(45) **Date of Patent: Nov. 18, 2014**

(54) **CAPLESS MOUNTING FOR MOTOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 235 days.

(21) Appl. No.: **13/626,652**

(22) Filed: **Sep. 25, 2012**

(65) **Prior Publication Data**

US 2014/0084726 A1 Mar. 27, 2014

(51) **Int. Cl.**
H02K 5/00 (2006.01)

(52) **U.S. Cl.**
USPC **310/91**; 310/51

(58) **Field of Classification Search**
USPC 310/51, 89–91, 400–410
See application file for complete search history.

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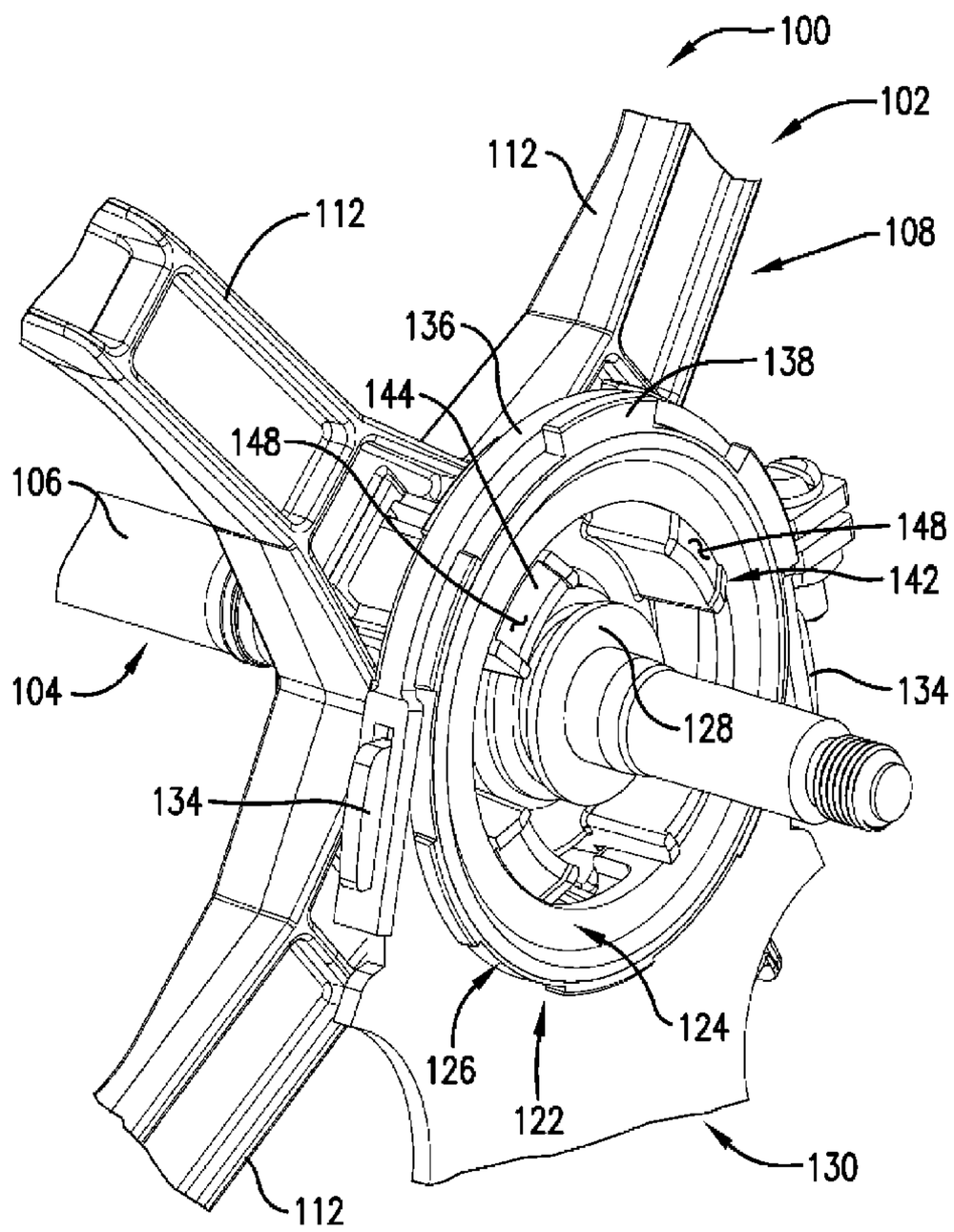
(57) **ABSTRACT**

A motor is provided for use in a machine. The motor includes a frame having a catch and a mounting ring retained on the frame by the catch. The motor is supported in the machine by the mounting ring.

19 Claims, 15 Drawing Sheets



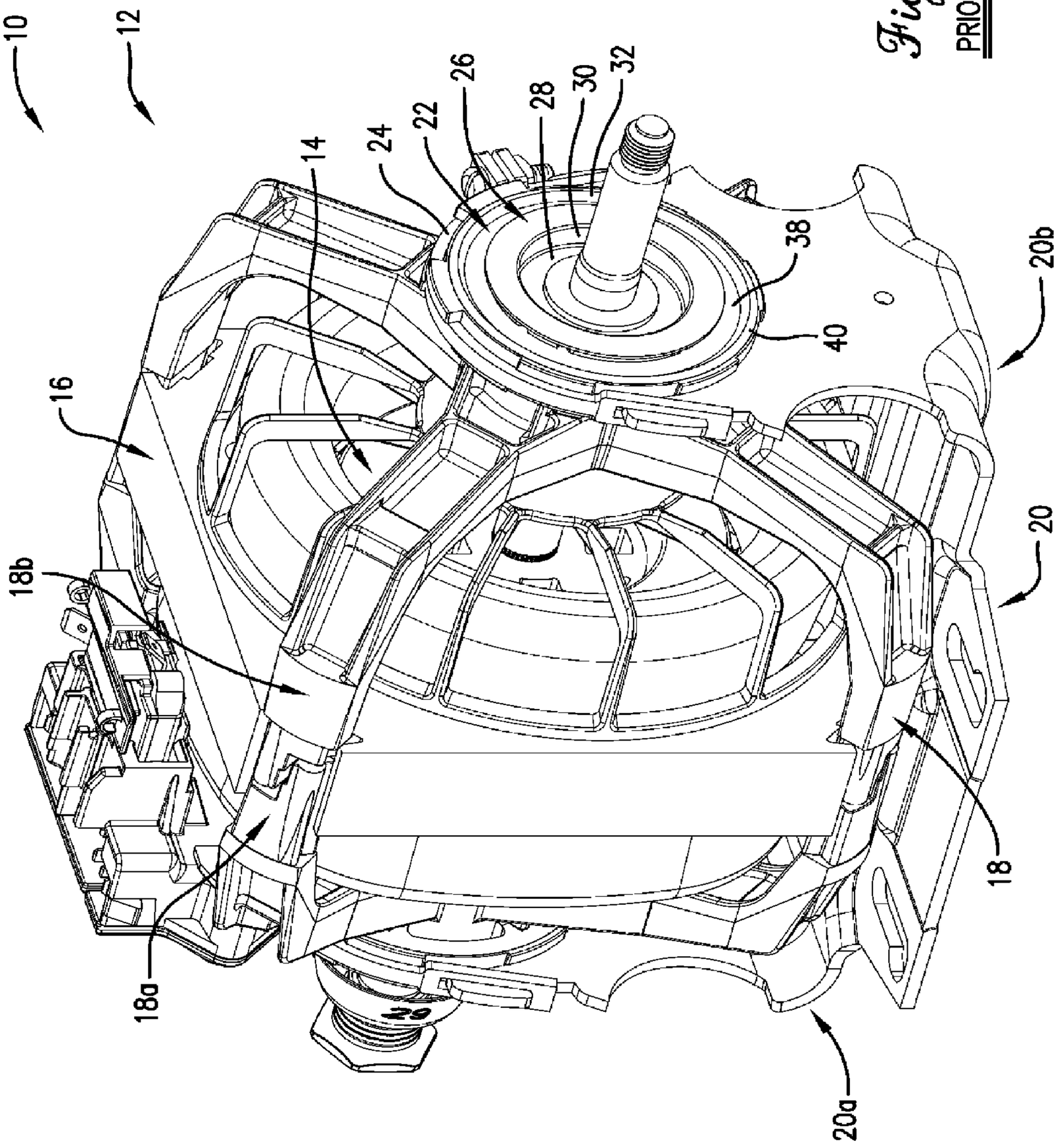


Fig. 1.
PRIOR ART

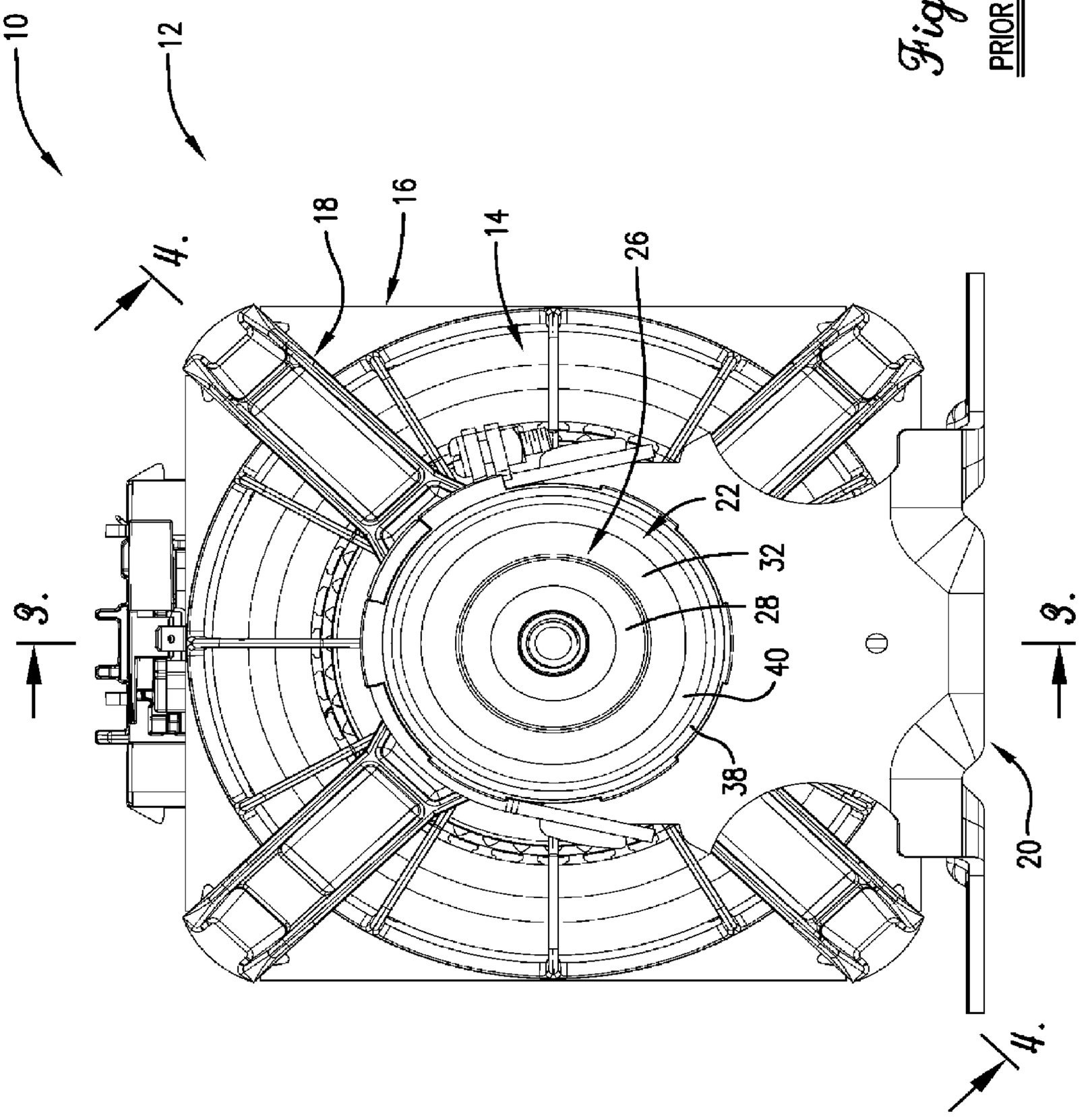


Fig. 2.
PRIOR ART

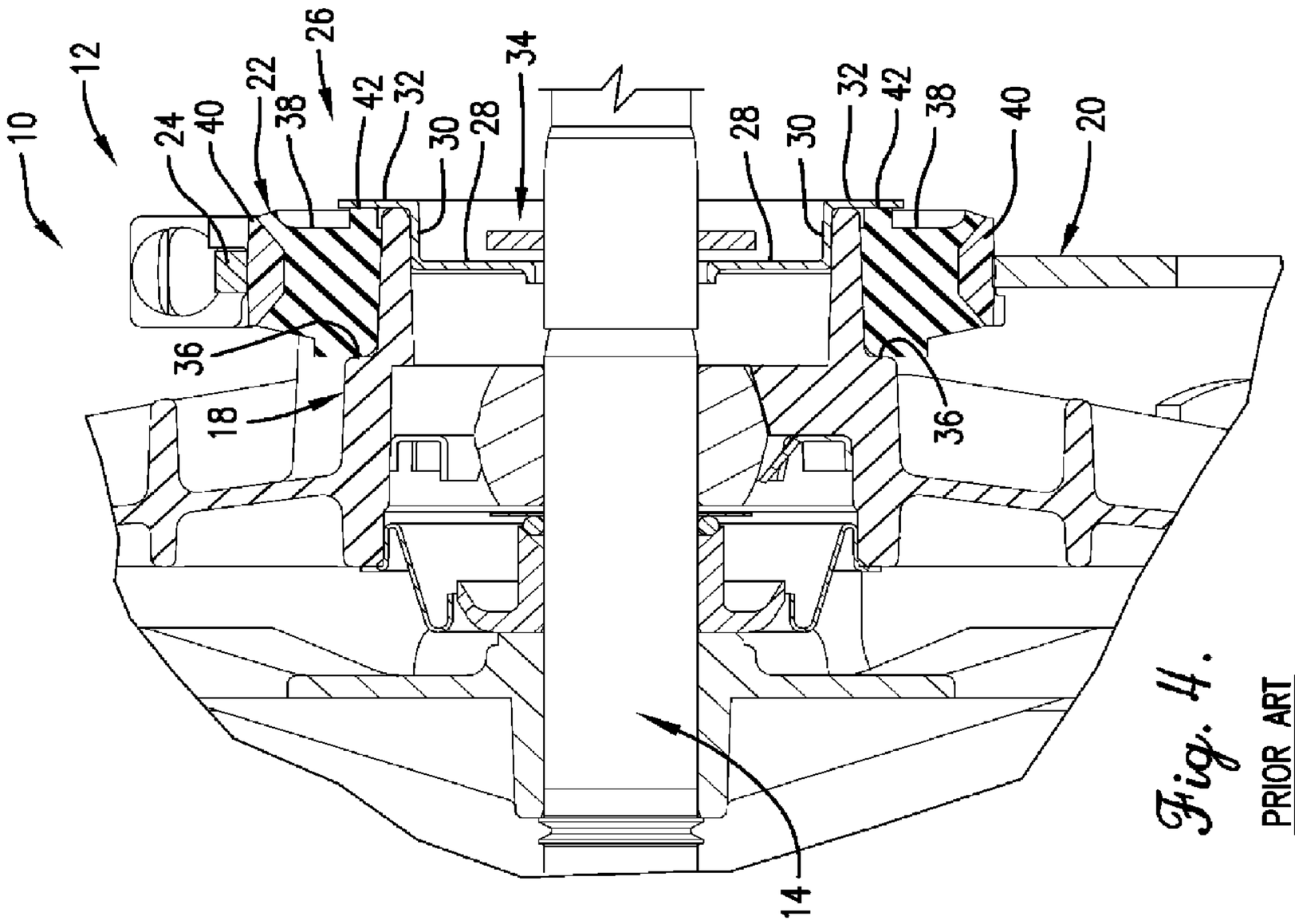


Fig. 4.
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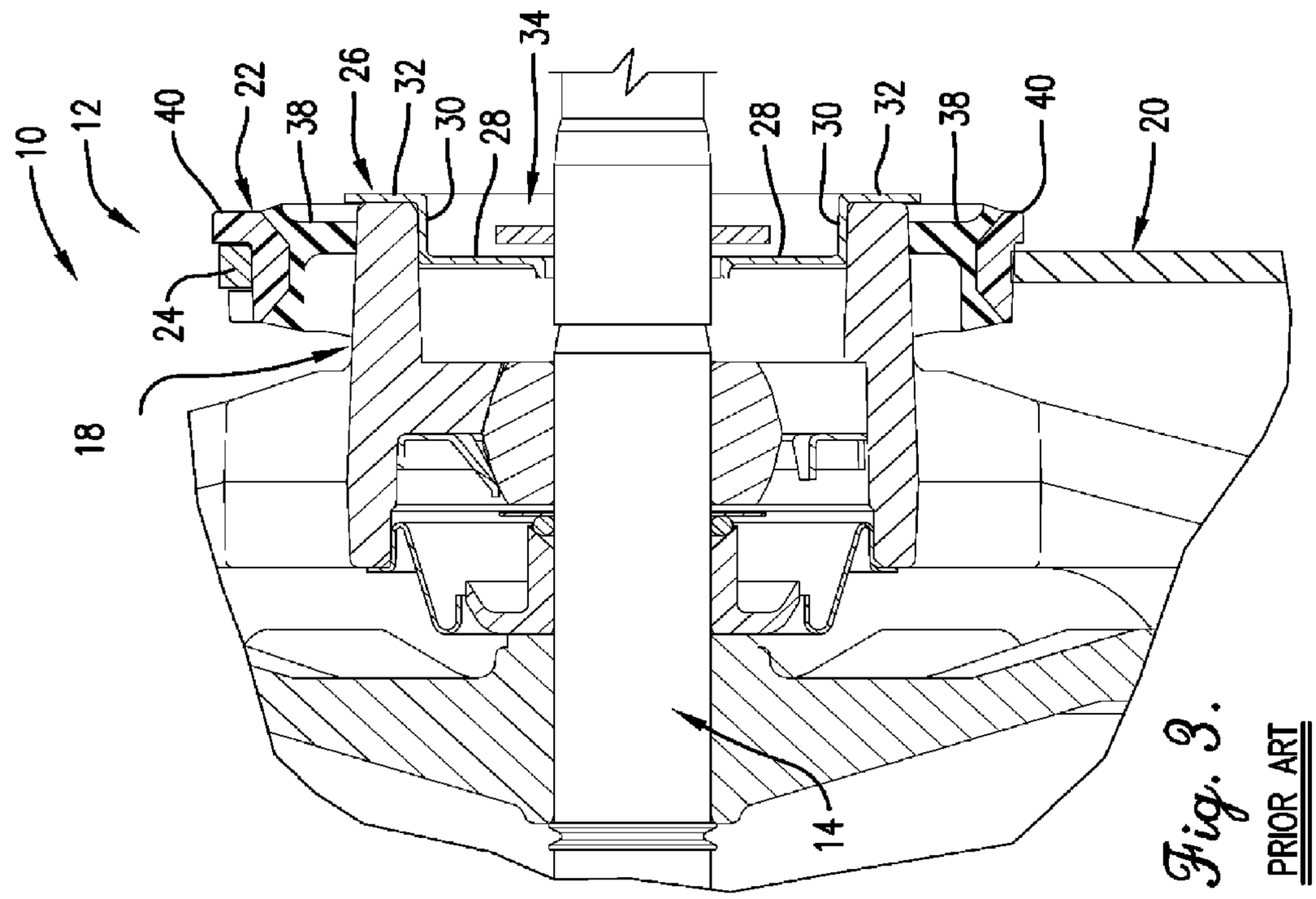
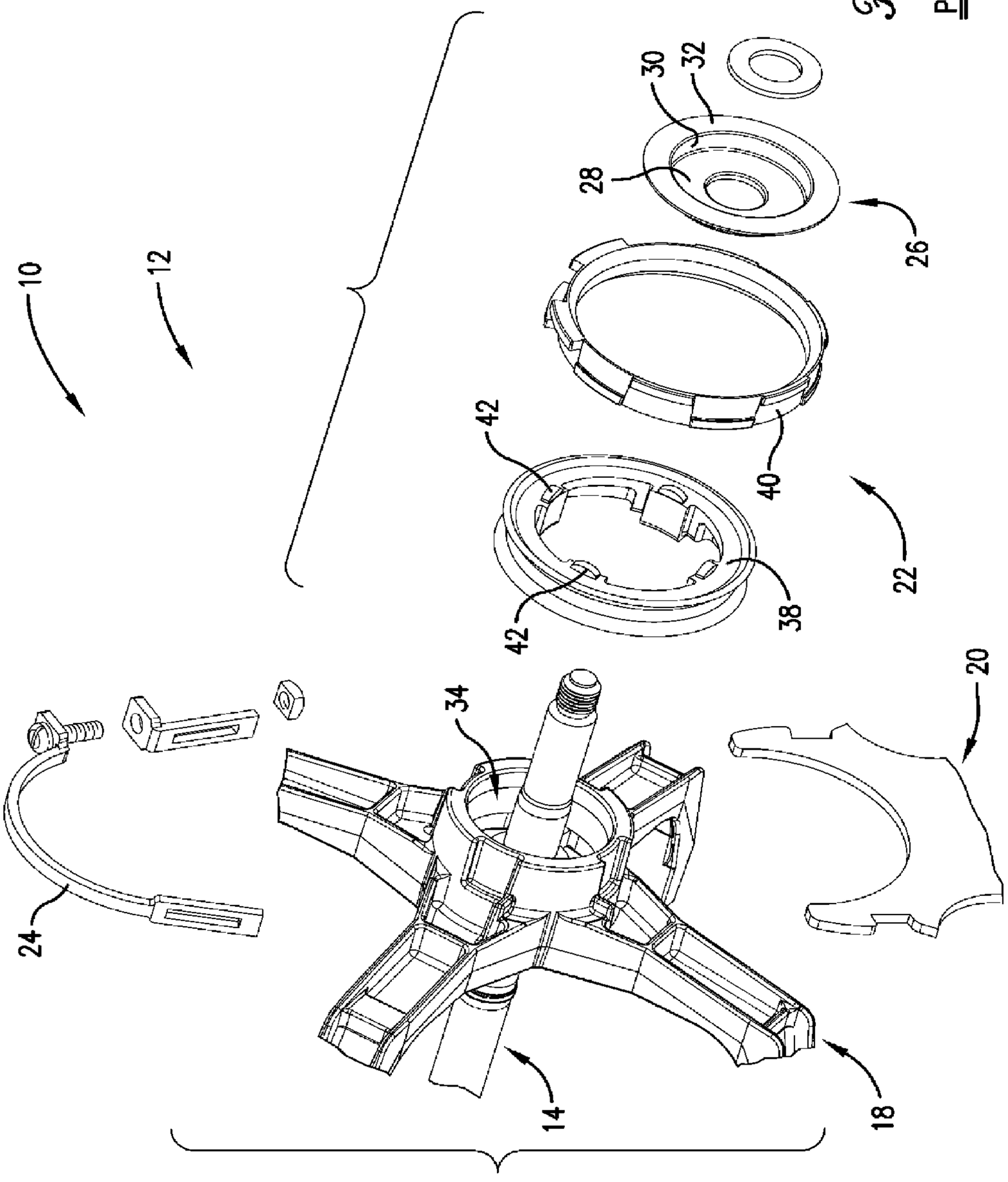


Fig. 3.
PRIOR ART

Fig. 5.
PRIOR ART



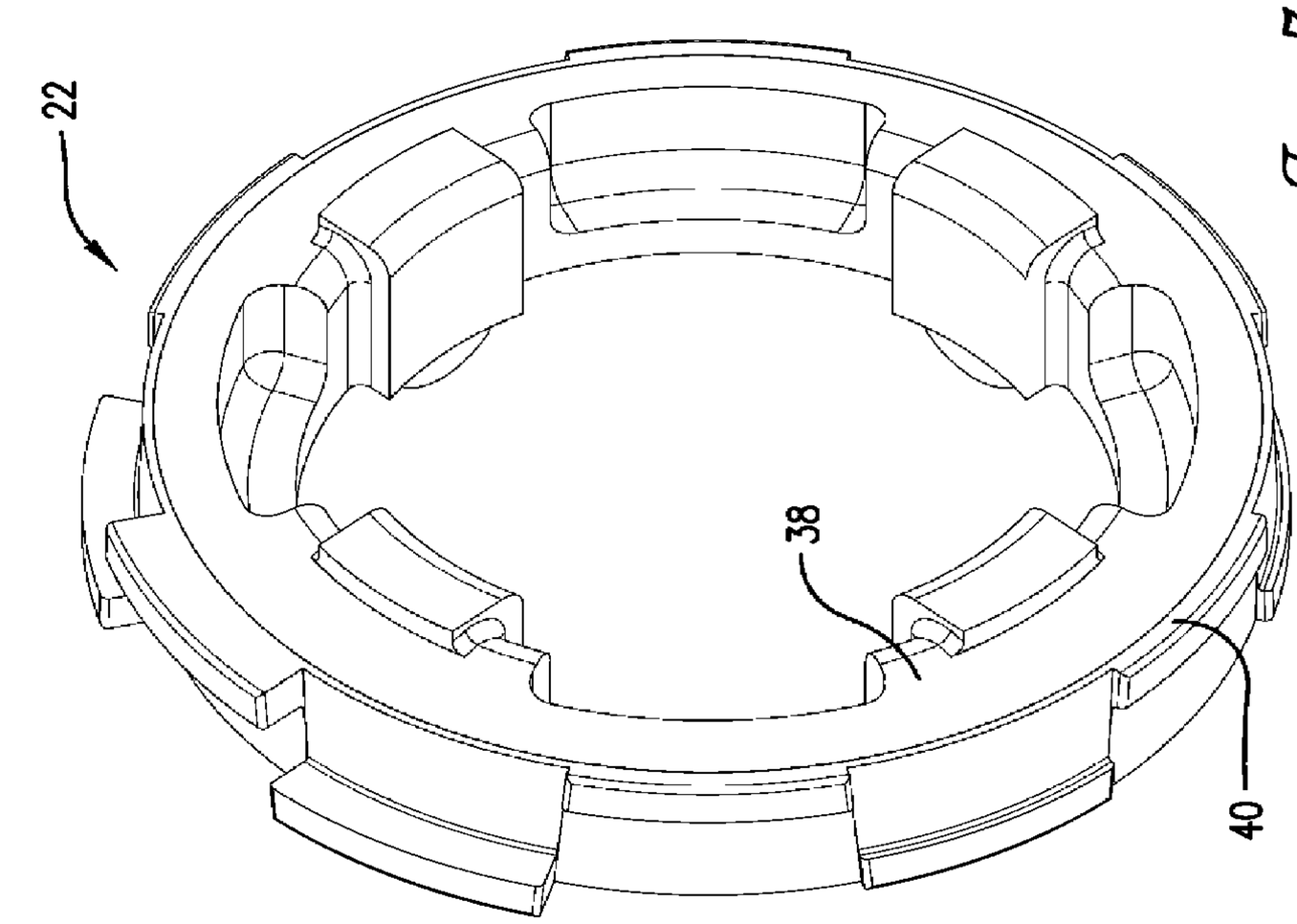


Fig. 7.
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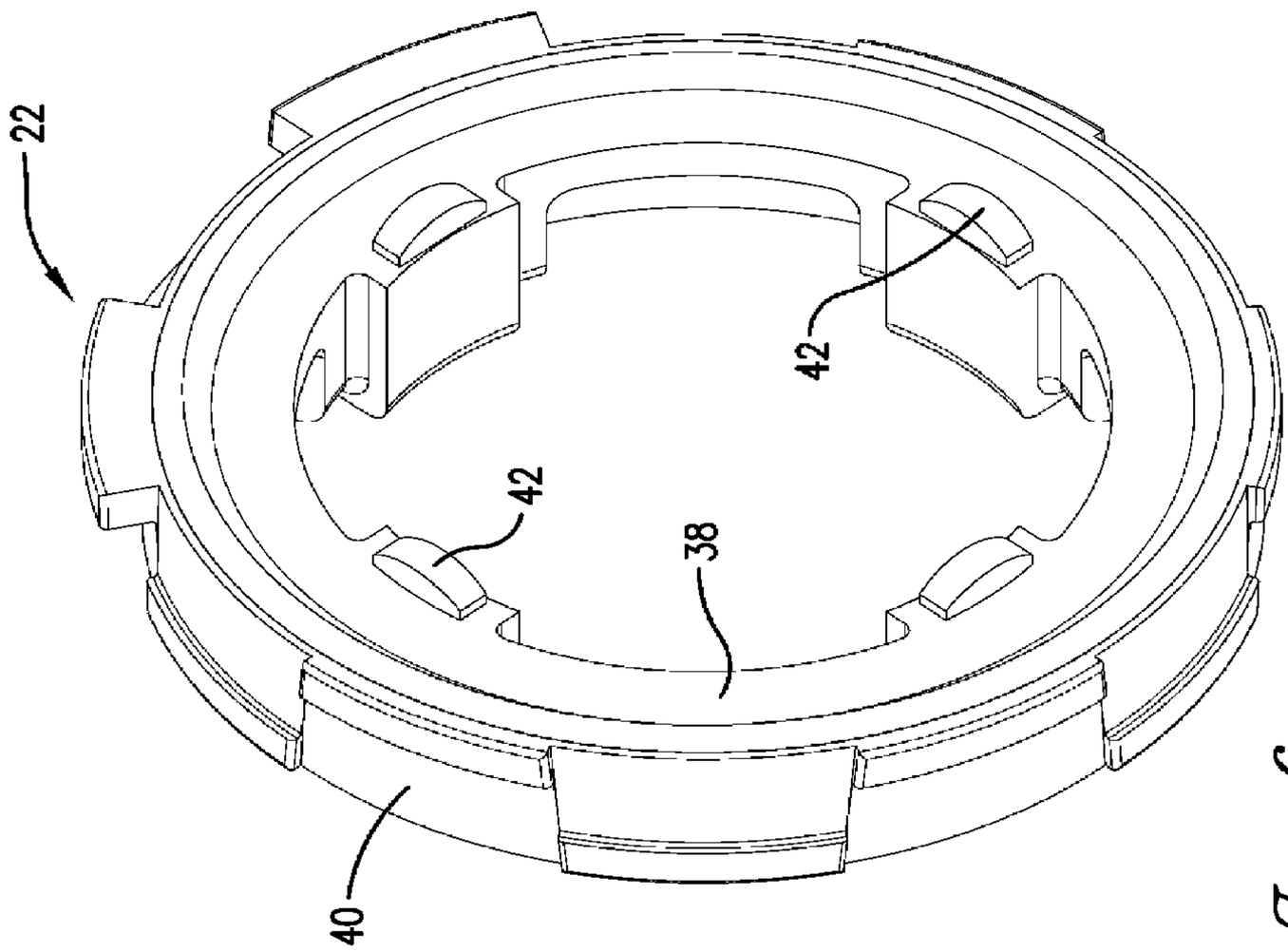

Fig. 6.
PRIOR ART

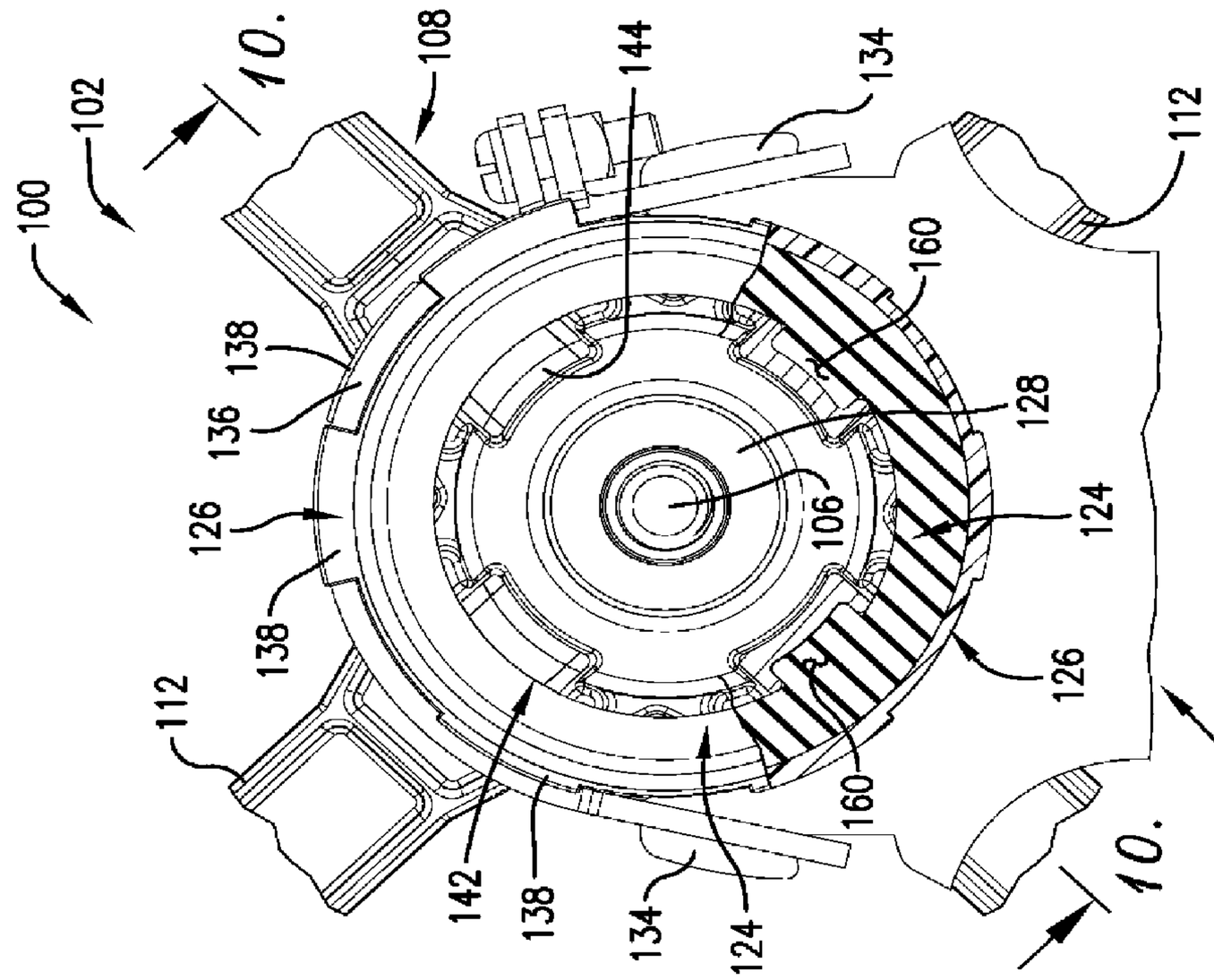
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Fig. 9.

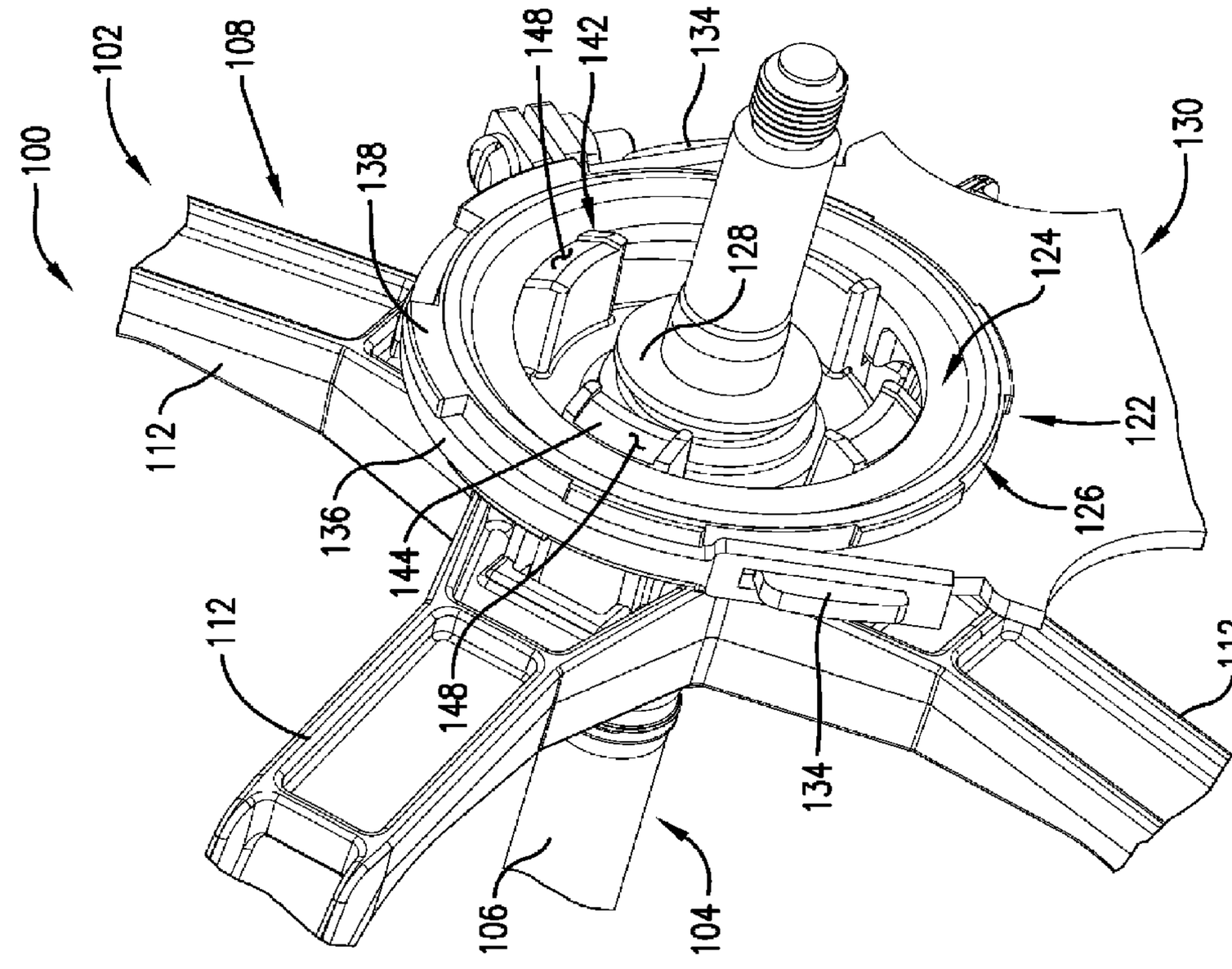
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Fig. 8.

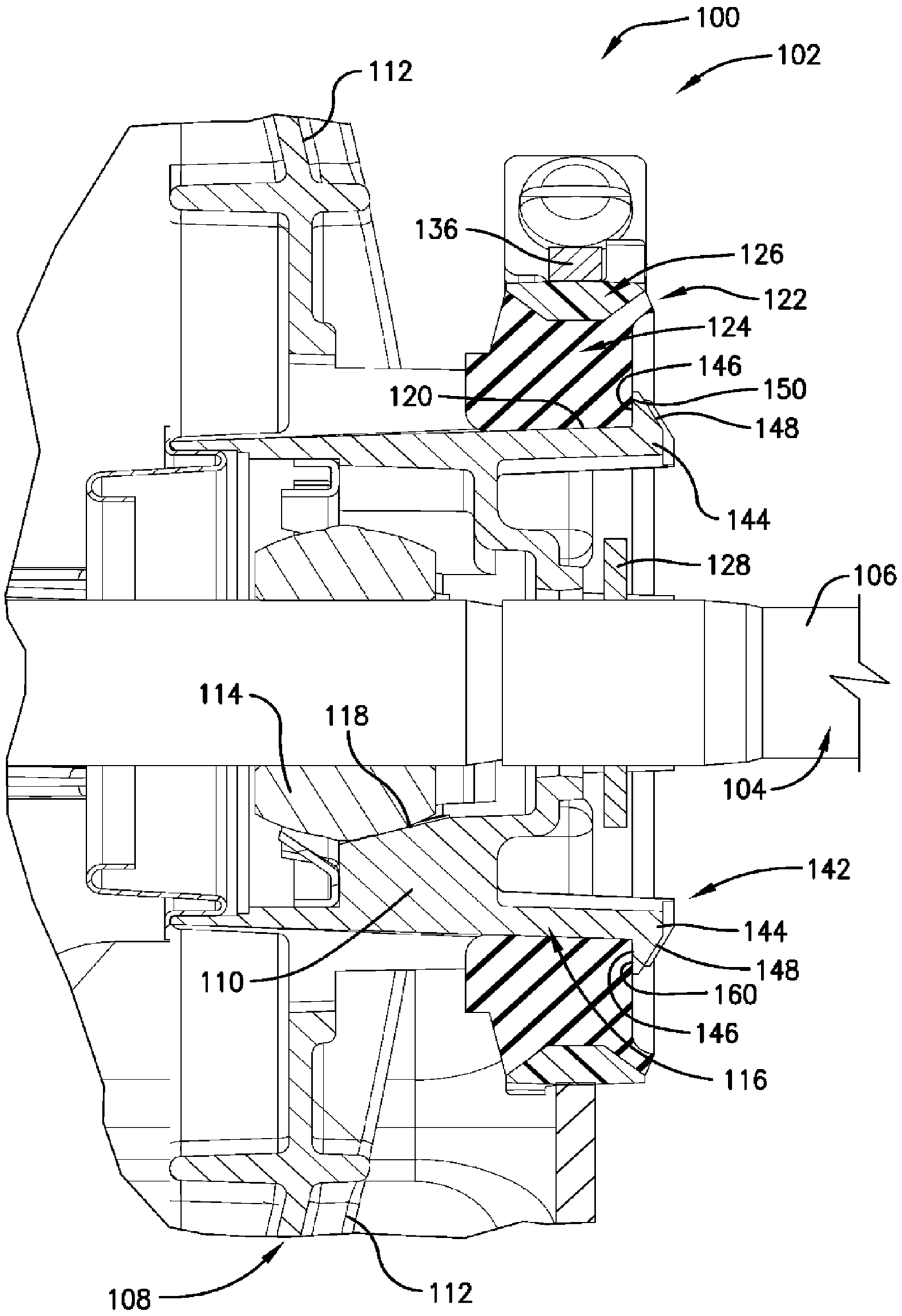
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Fig. 10.

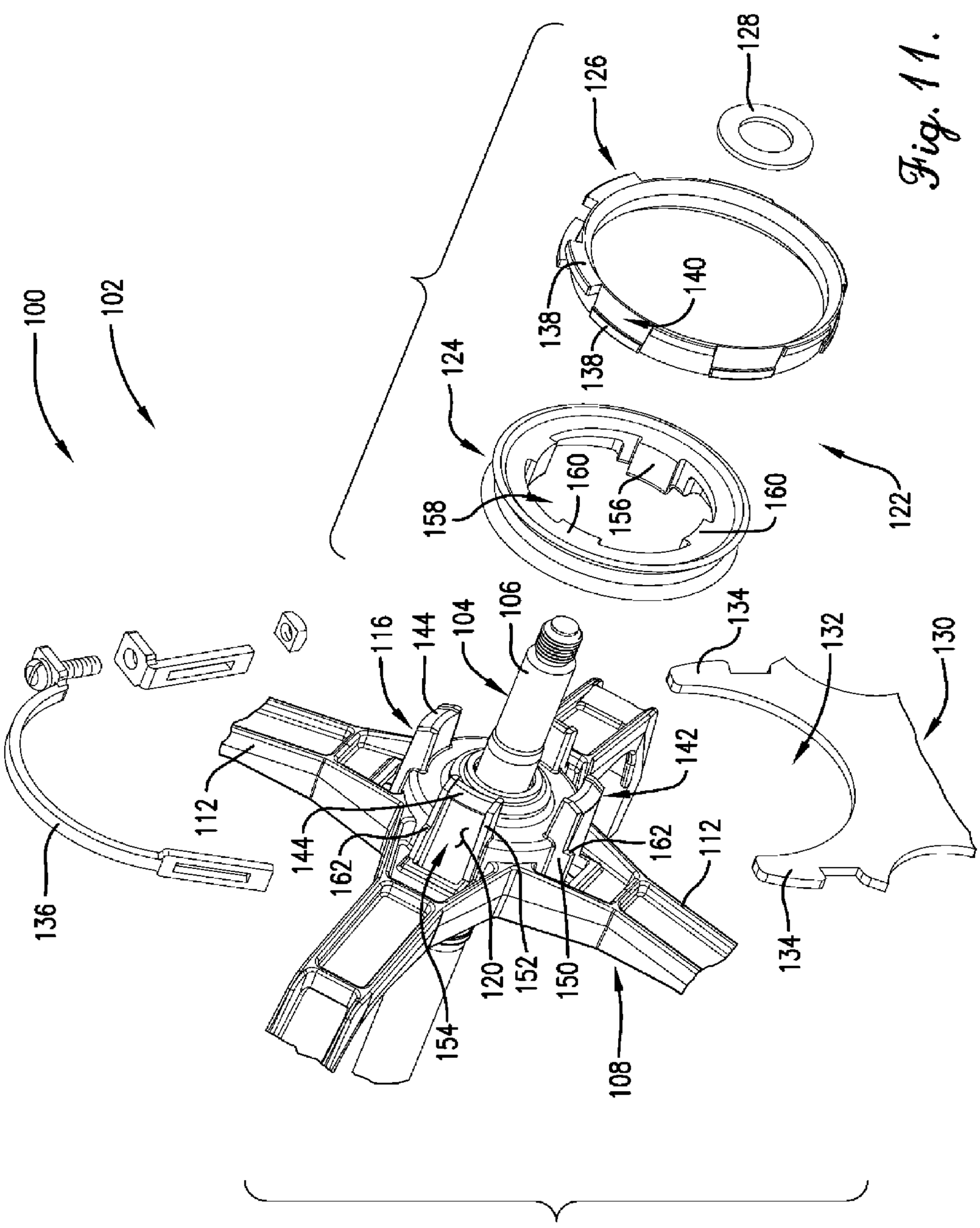
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Fig. 11.

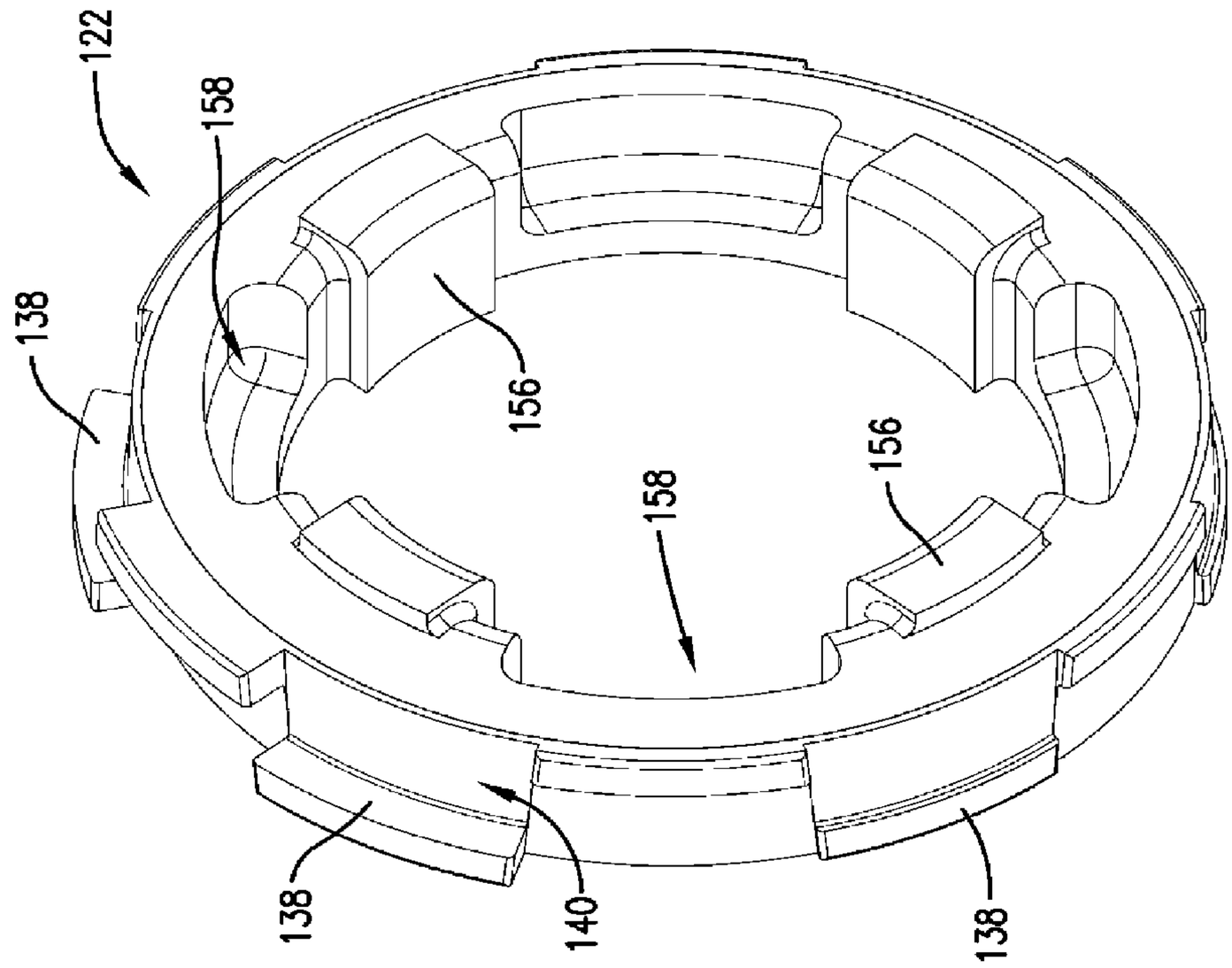
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Fig. 13.

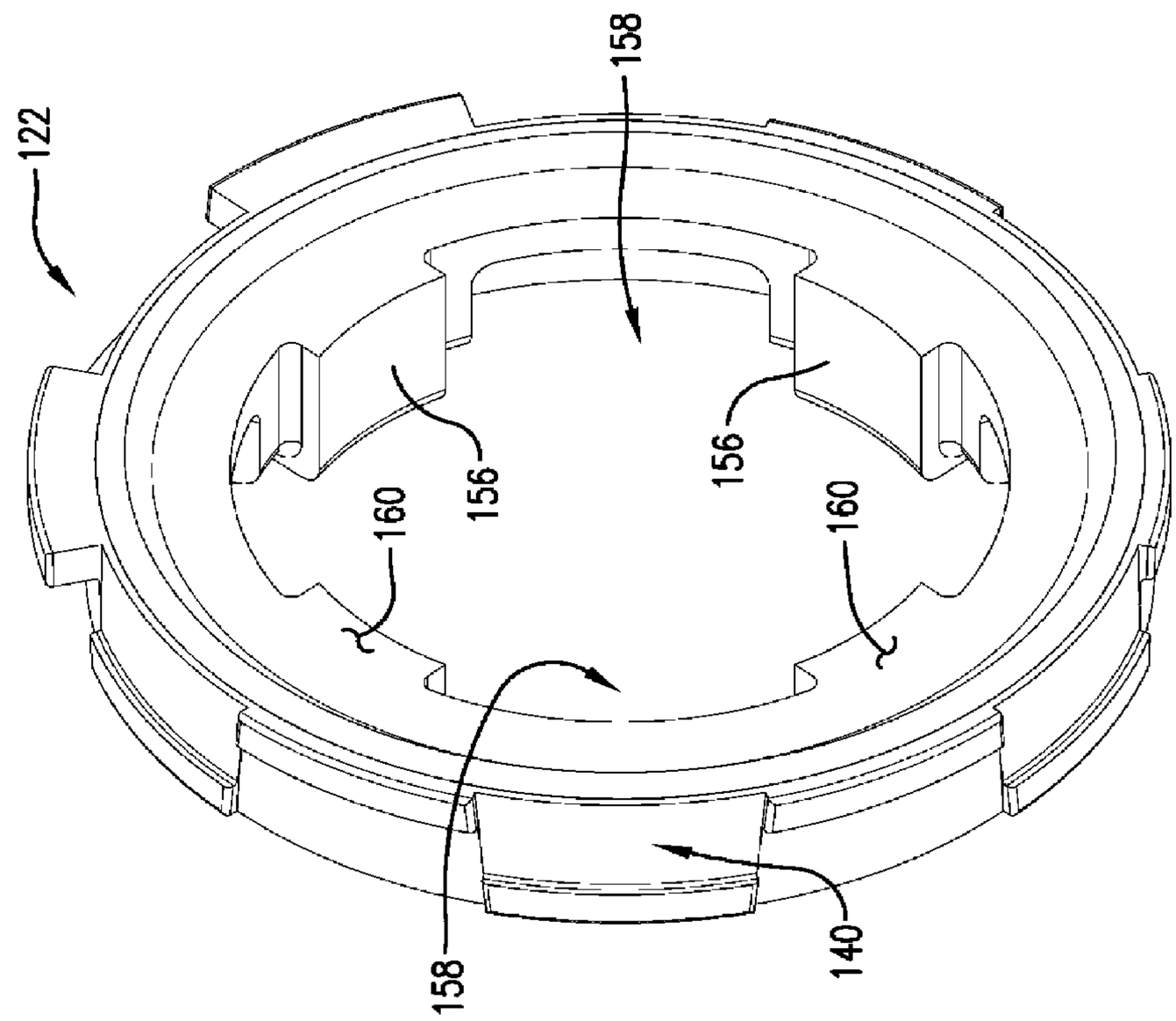
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Fig. 12.

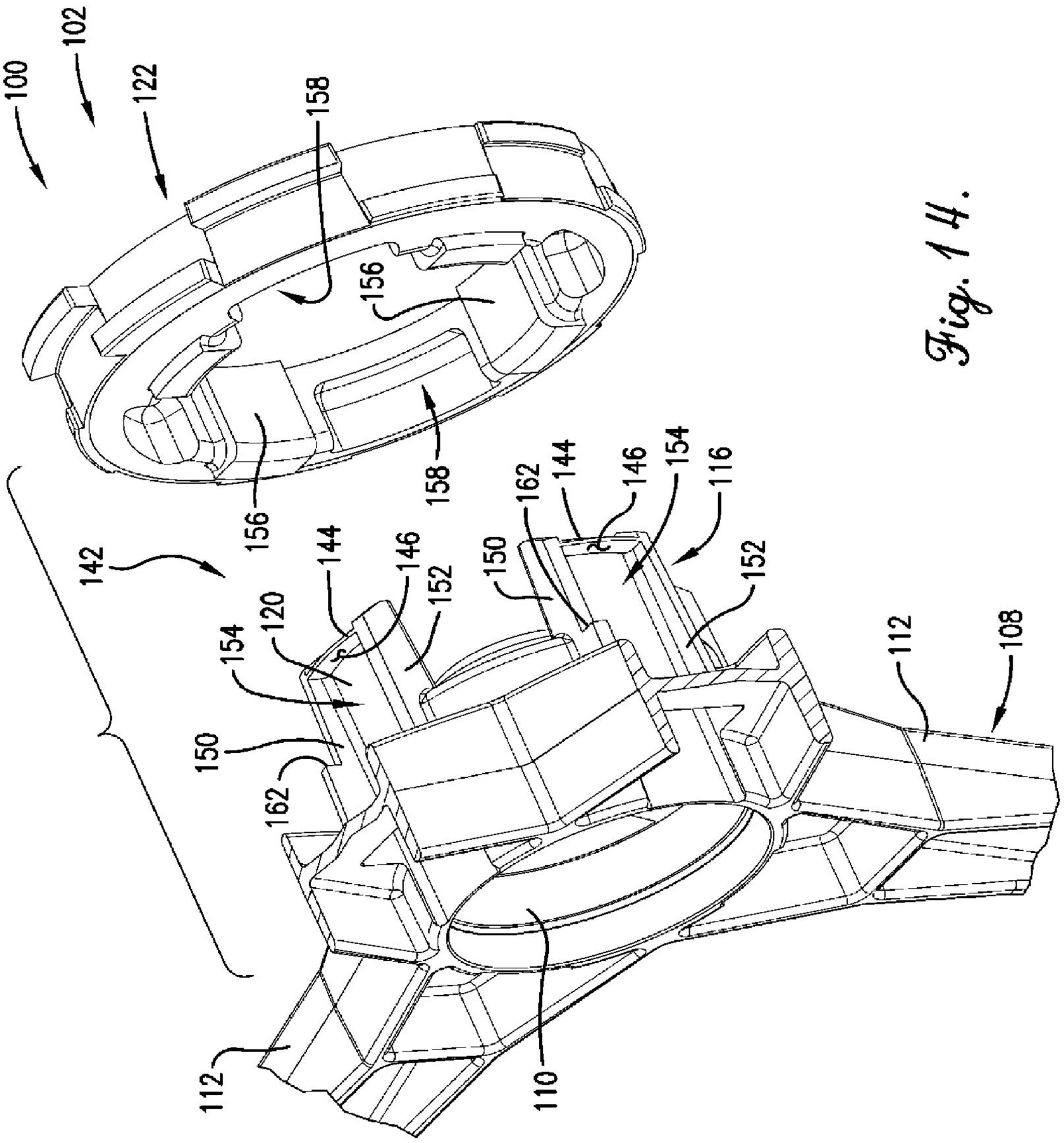
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Fig. 14.

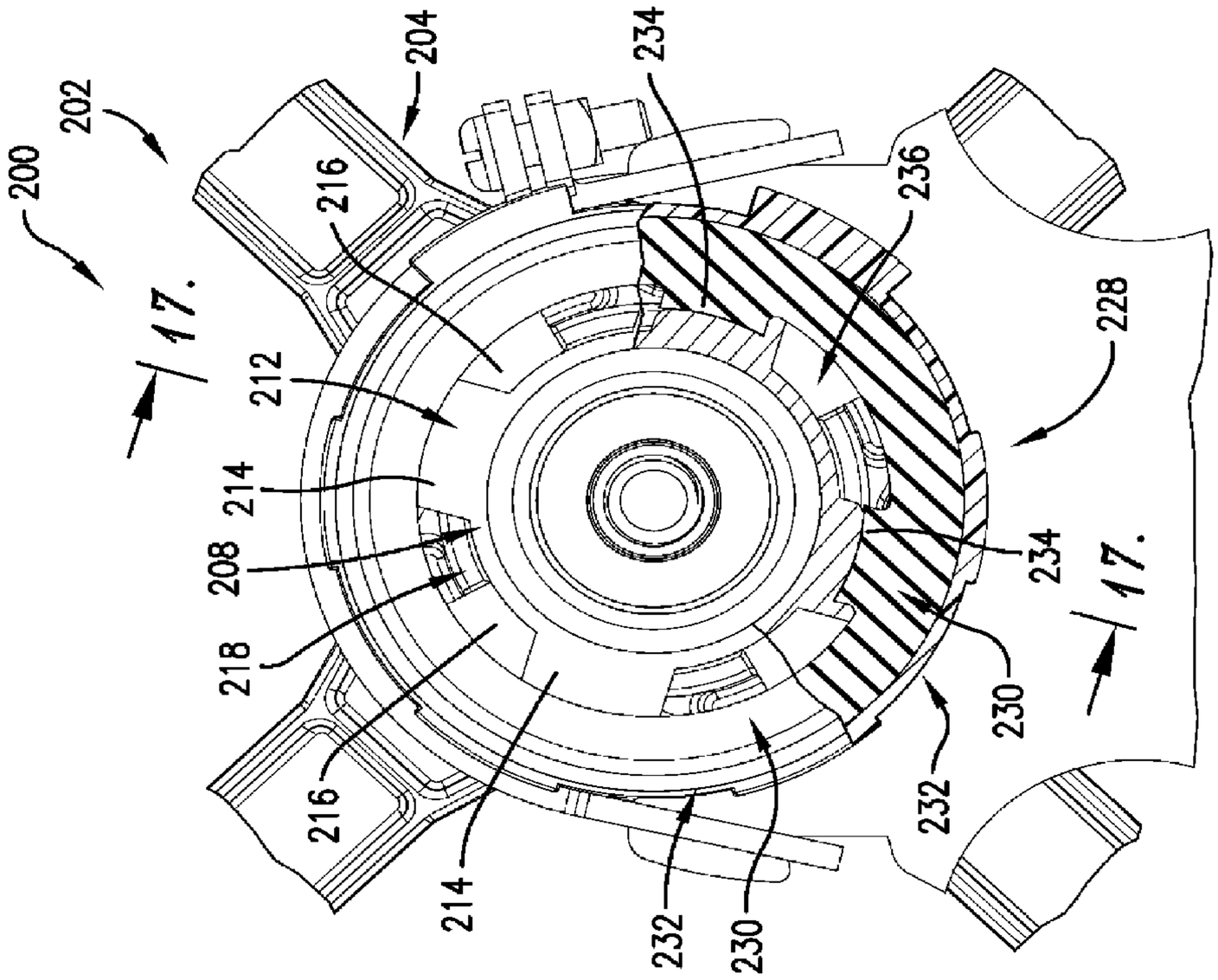
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Fig. 16.

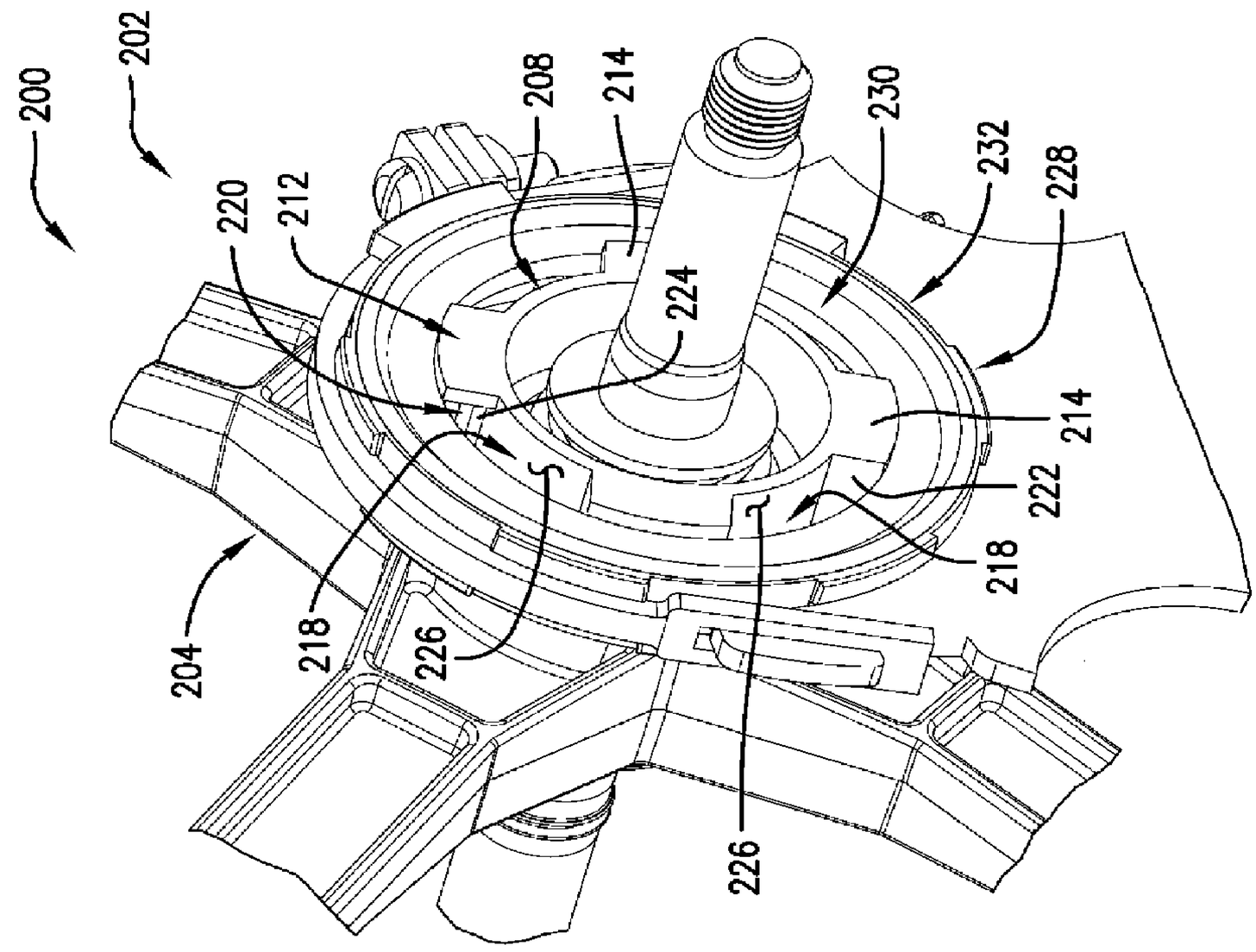
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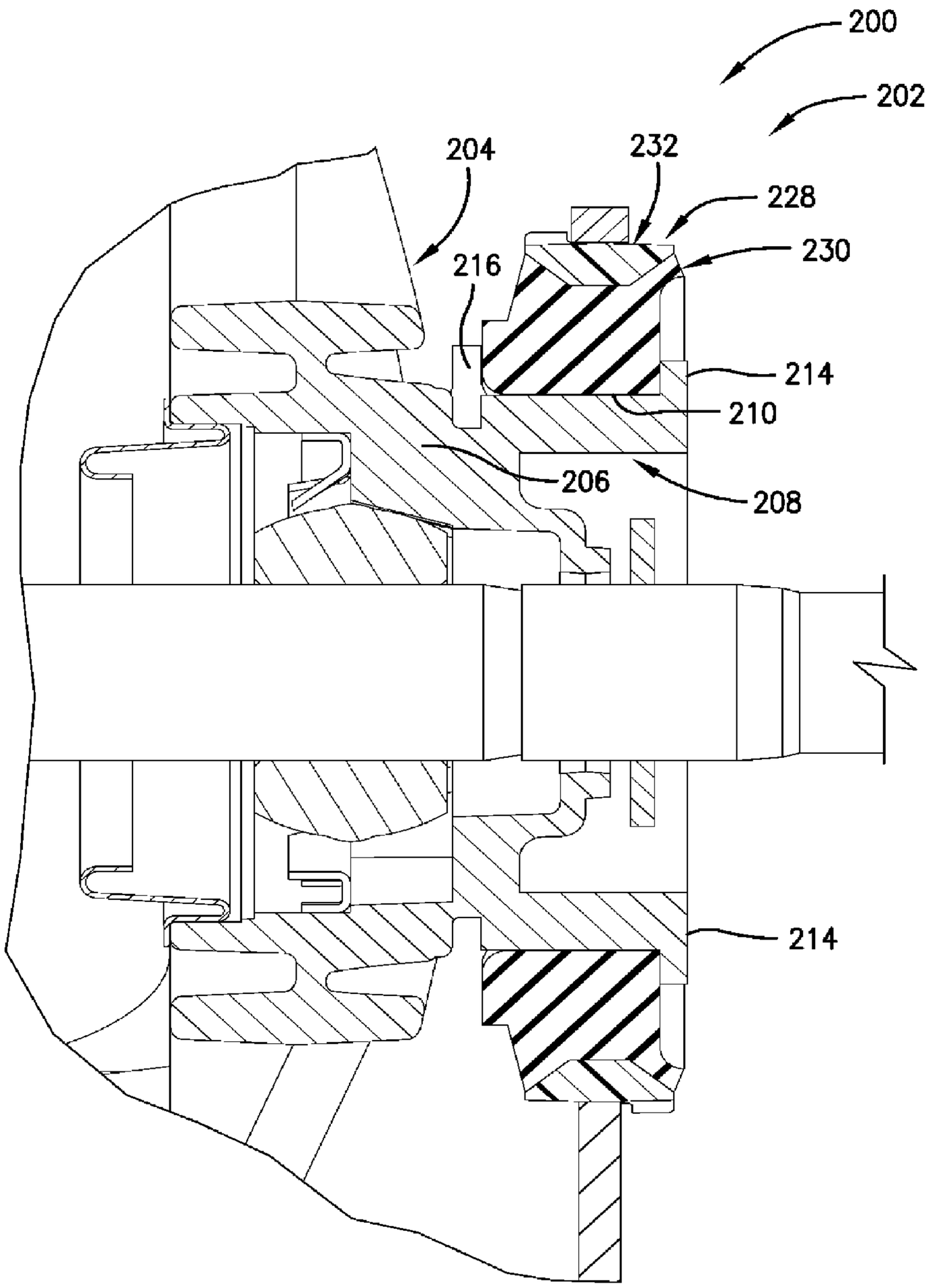
Fig. 15.



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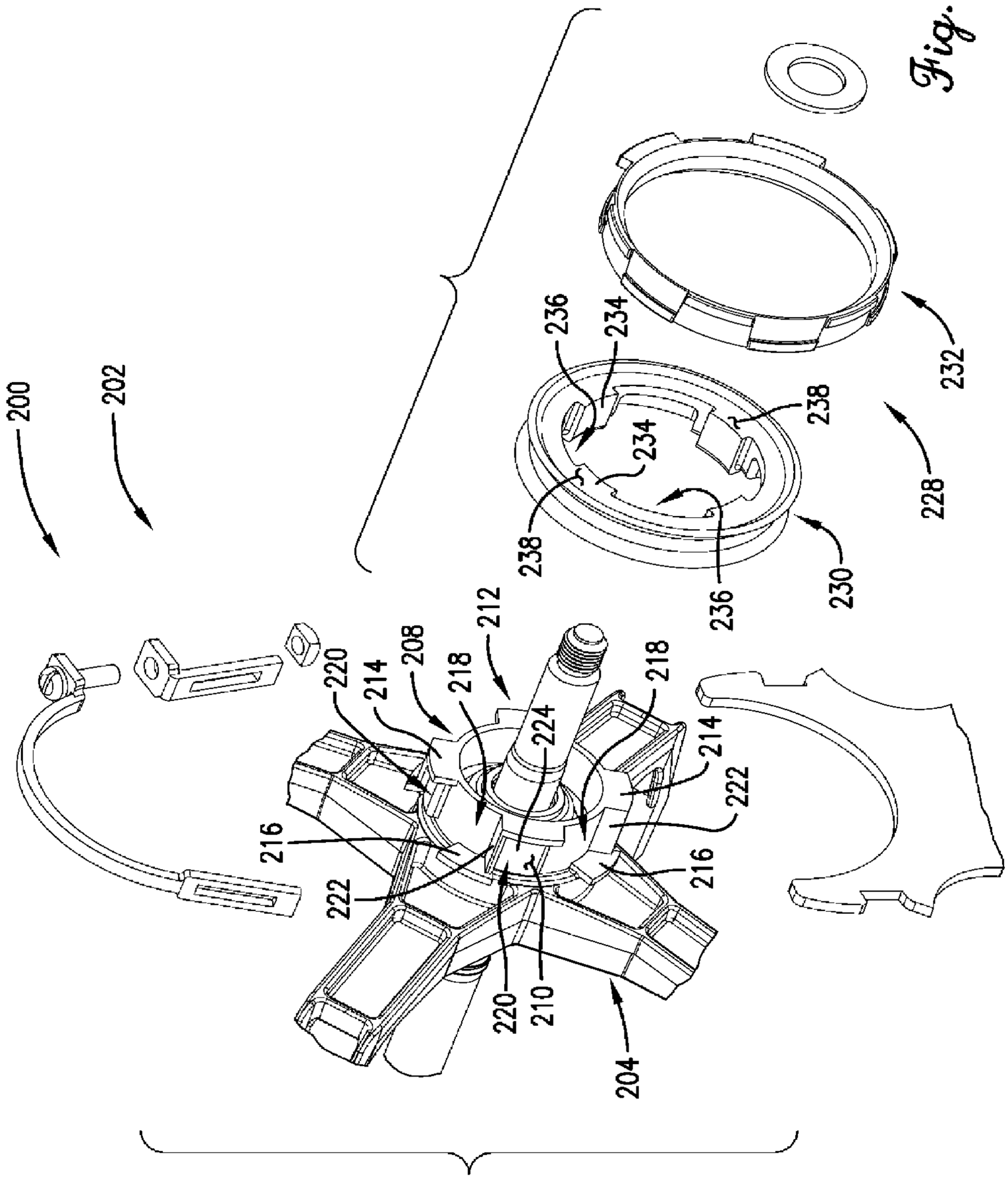
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Fig. 18.

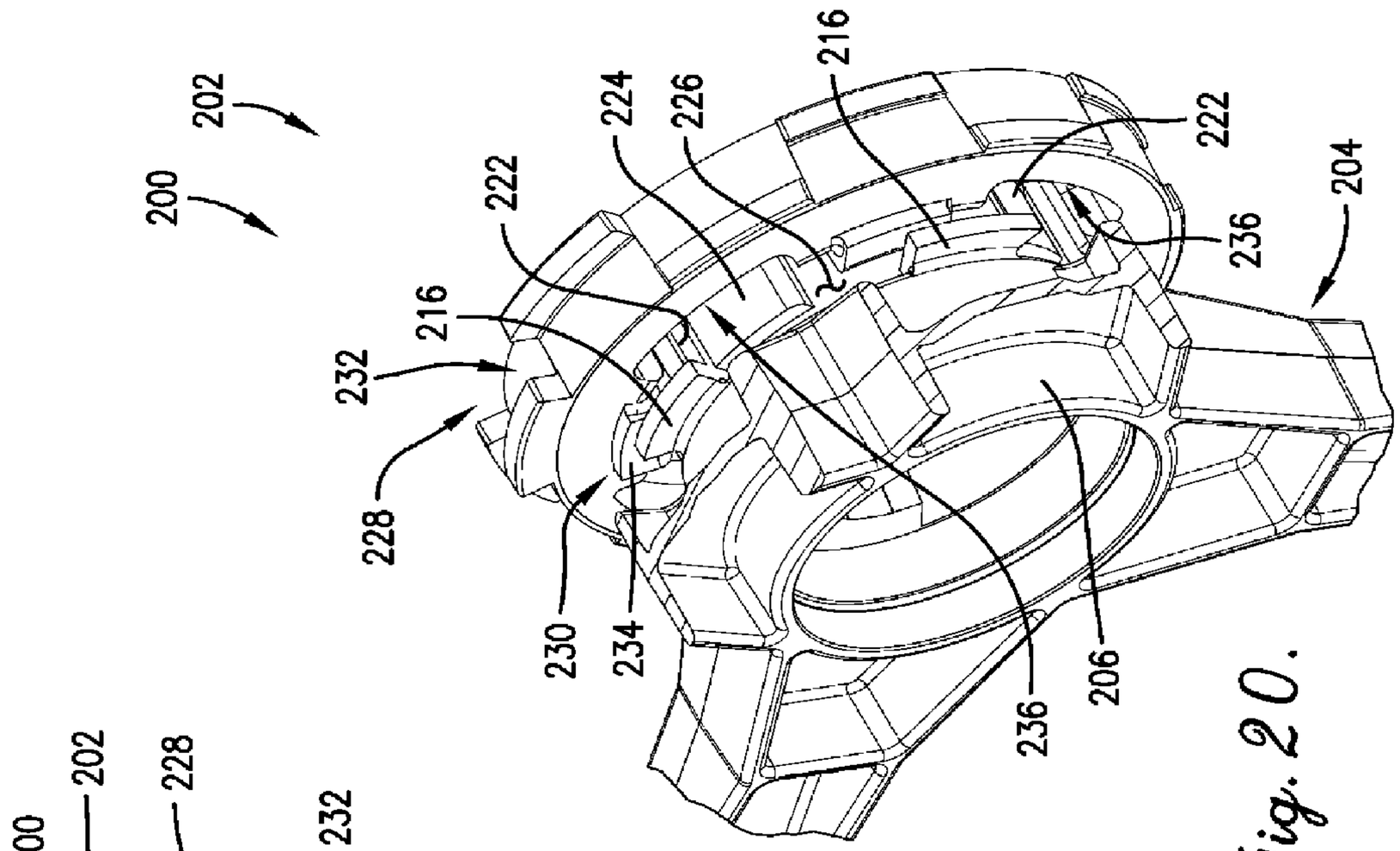
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Fig. 20.

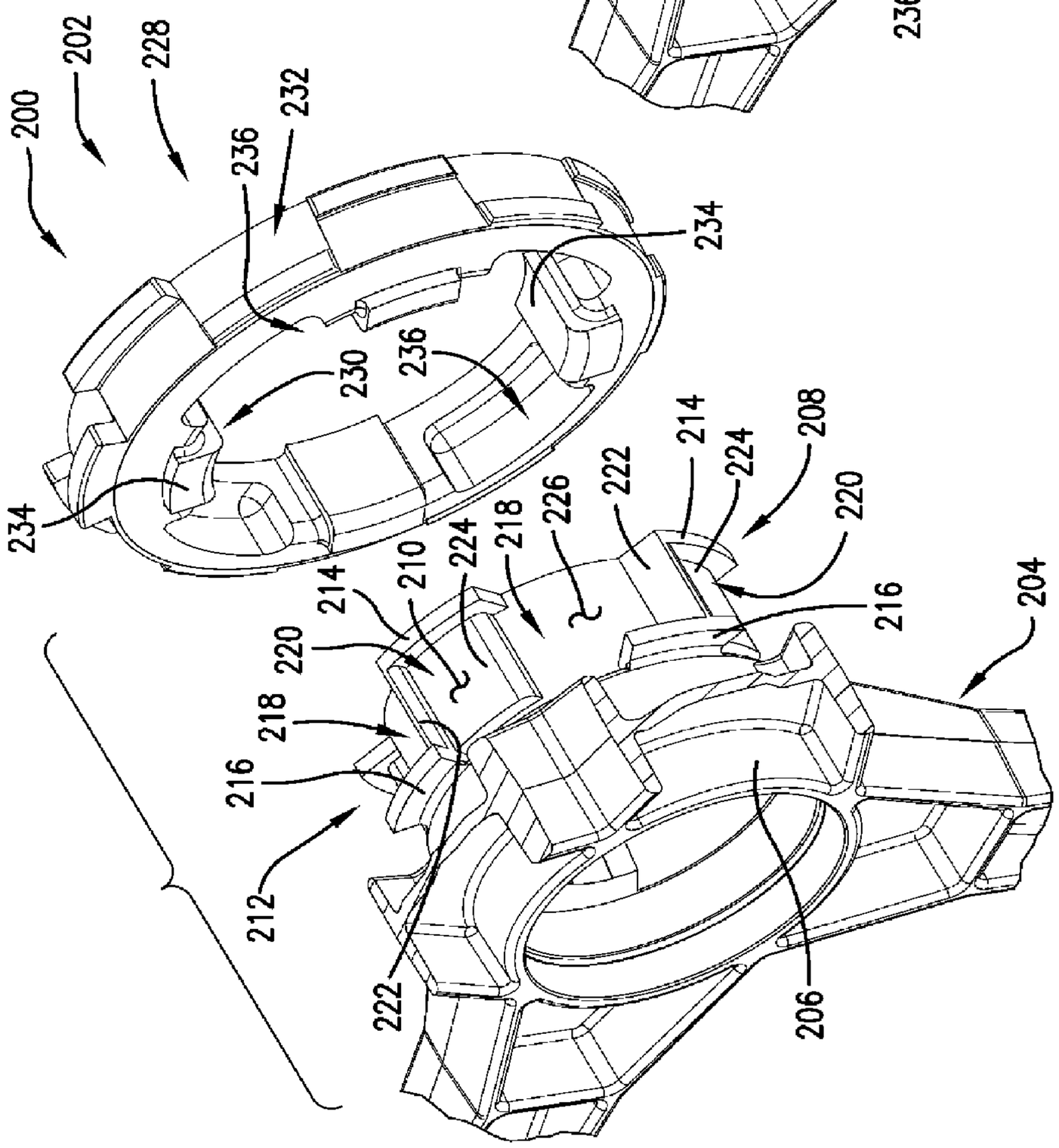
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Fig. 19.

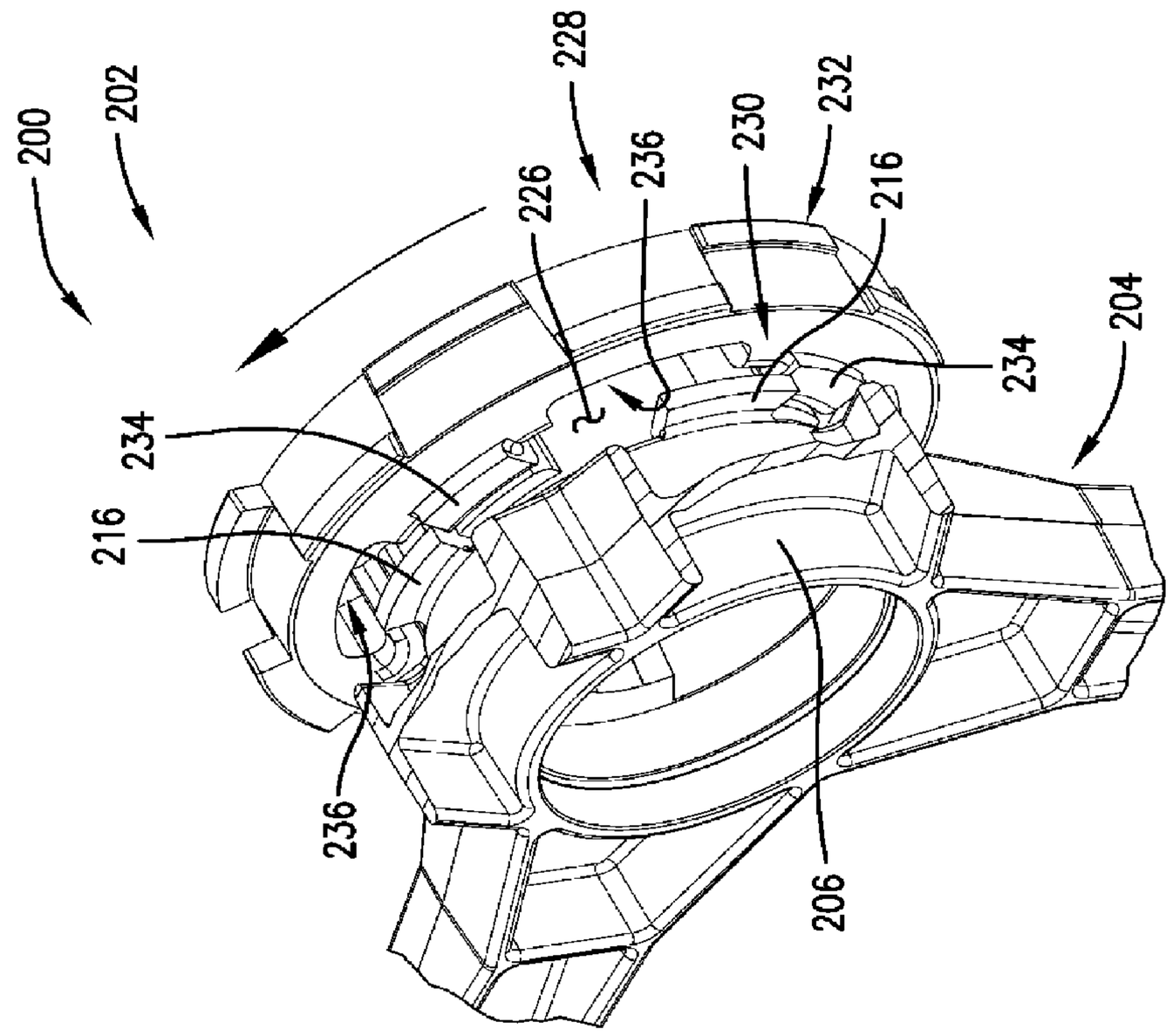
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Fig. 22.

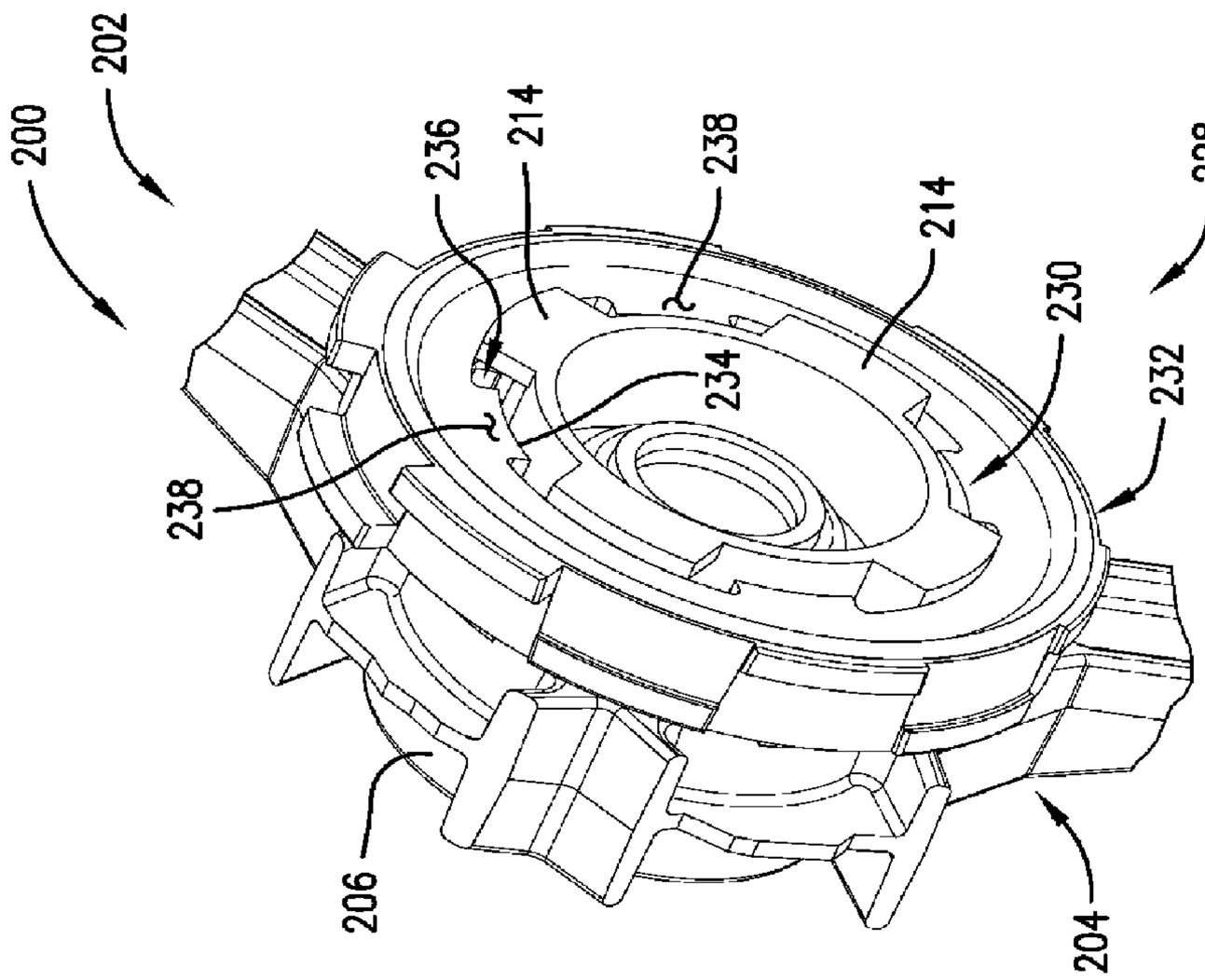
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Fig. 21.

CAPLESS MOUNTING FOR MOTOR

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates generally to mounting of an electric motor within a machine. More specifically, the present invention concerns an electric motor including a motor frame and a mounting ring configured to be secured in the ring-receiving opening of a motor support.

2. Discussion of the Prior Art

Those of ordinary skill in the art will appreciate that electric motors are often used in home appliances such as washing machines and clothes dryers. In a clothes dryer, for instance, an electric motor may be provided to rotate a shaft. A pulley may be rotatably driven by the shaft to induce rotation of a drum in which articles of clothing are tumbled and dried.

Although a variety of motor mounting arrangements are used, one known embodiment includes a mounting ring that is part of the motor and supported on the machine. A mounting cap is provided to secure the mounting ring on the motor.

SUMMARY

According to one aspect of the present invention, a motor for a machine is provided. The machine includes a motor support with a ring-receiving opening. The motor also includes a rotor, a stator, a mounting ring, and a motor frame. The mounting ring is configured to be secured in the ring-receiving opening of the motor support. The mounting ring includes a resiliently deformable portion configured to dampen relative motion between the motor and the machine. The mounting ring includes a locking surface. The motor frame operably supports the rotor and stator. The motor frame is also interconnected with the mounting ring and thereby supported on the motor support. The motor frame includes an integral catch engaging the locking surface to at least substantially block separation of the mounting ring from the motor frame.

This summary is provided to introduce a selection of concepts in a simplified form. These concepts are further described below in the detailed description of the preferred embodiments. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

Various other aspects and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments and the accompanying drawing figures.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

Preferred embodiments of the present invention are described in detail below with reference to the attached drawing figures, wherein:

FIG. **1** is a front perspective view of a prior art machine;

FIG. **2** is a front elevational view of the prior art machine of FIG. **1**;

FIG. **3** is a fragmentary side sectional view of the prior art machine of FIGS. **1** and **2**, taken along section line **3-3** in FIG. **2**;

FIG. **4** is side sectional view of the prior art machine of FIG. **3**, taken along section line **4-4** in FIG. **2**;

FIG. **5** is an exploded perspective view of the prior art machine of FIGS. **1-4**;

FIG. **6** is a front perspective view of the mounting ring of the prior art machine of FIGS. **1-5**;

FIG. **7** is a rear perspective view of the mounting ring of FIG. **6**;

FIG. **8** is a fragmentary front perspective view of a machine constructed in accordance with a first preferred embodiment of the present invention;

FIG. **9** is a front view of the machine of FIG. **8**;

FIG. **10** is a side sectional view of the machine of FIGS. **8** and **9**;

FIG. **11** is an exploded perspective view of the machine of FIGS. **8-10**;

FIG. **12** is a front perspective view of the mounting ring of the machine of FIGS. **8-11**;

FIG. **13** is a rear perspective view of the mounting ring of FIG. **12**;

FIG. **14** is an exploded perspective view of the frame and mounting ring of the machine of FIGS. **8-11**;

FIG. **15** is a fragmentary front perspective view of a machine constructed in accordance with a first preferred embodiment of the present invention;

FIG. **16** is a front view of the machine of FIG. **15**;

FIG. **17** is a side sectional view of the machine of FIGS. **15** and **16**;

FIG. **18** is an exploded perspective view of the machine of FIGS. **15-17**;

FIG. **19** is an exploded rear perspective view of the frame and mounting ring of the machine of FIGS. **15-18**, prior to axial movement of the ring onto the frame for assembly;

FIG. **20** is a rear perspective view of the frame and mounting ring of FIG. **19**, after axial movement of the ring onto the frame and prior to twisting of the ring about the frame for assembly;

FIG. **21** is a front perspective view of the frame and mounting ring as shown in FIG. **20**, after axial movement of the ring onto the frame and prior to twisting of the ring about the frame for assembly; and

FIG. **22** is a rear perspective view of the frame and mounting ring of FIGS. **19-21**, after twisting of the ring about the frame for assembly.

The drawing figures do not limit the present invention to the specific embodiments disclosed and described herein. The drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the preferred embodiments.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is susceptible of embodiment in many different forms. While the drawings illustrate, and the specification describes, certain preferred embodiments of the invention, it is to be understood that such disclosure is by way of example only. There is no intent to limit the principles of the present invention to the particular disclosed embodiments.

With initial reference to FIGS. **1-7**, a prior art machine **10** including a motor **12** is depicted. The machine **10** may suitably be any one of a variety of types, including but not limited to clothes dryers, washing machines, etc. It is noted that the motor is particularly suitable for use in a horizontal orientation, with the rotor axis being at least generally horizontal, although such an arrangement is not required. The motor **12** includes a rotor **14** that is rotatable about an axis and a stator **16** positioned radially outside the rotor **14**. A motor frame **18** supports the stator **16**, and the motor **12** as a whole is supported in the machine **10** on a motor support **20**.

As is apparent from FIG. **1**, the axial halves of the motor **12** are configured in a substantially symmetrical manner. For instance, the frame **18** includes at least substantially identical portions **18***a*,**18***b*, and the support **20** includes at least substantially identical portions **20***a*,**20***b*. Therefore, for the sake of convenience and clarity, further discussion of the machine **10** and the motor **12** will refer only to one axial portion of the motor **12** (e.g, to the components associated with a single frame portion **18***a* or **18***b*). It should be understood, however, that it is permissible for one or more additional components similar to or identical to those described below to be present in the motor **12** or the machine **10** as a whole.

With continued reference to FIG. **1**, the motor **12** is supported in the machine **10** by an annular mounting ring **22** that rests on the motor support **20**. As is customary, a strap **24** is provided to prevent movement of the motor **12** away from the support **20** due to vibration or other jarring of the machine **10**.

As shown in FIGS. **1-5**, the mounting ring **22** is secured on the motor **12** by a mounting cap **26**. As best shown in FIGS. **3-5**, the mounting cap **26** includes a radially extending plate **28**, a circumferential sidewall **30** extending axially from the plate **28**, and an annular lip **32** extending radially from the sidewall **30**. The motor frame **18** defines a cap-receiving opening **34**. The plate **28** is sized such that the associated sidewall **30** frictionally engages the frame **18** when the cap **26** is inserted along a first axial direction into the cap-receiving opening **34**. That is, the cap **26** and the frame **18** are connected via a press fit. The lip **32** limits axial movement of the cap **26** into the cap-receiving opening **34** in the first direction and also at least substantially blocks movement of the mounting ring **22** away from the frame **18** in a second direction, wherein the second direction is opposite of the first direction. As best shown in FIGS. **4** and **5**, axial movement of the mounting ring **22** toward the frame **18** (in the first direction) is limited by a plurality of circumferentially spaced shoulders **36** that are part of the frame **18**.

As best shown in FIGS. **6** and **7**, the mounting cap **26** includes a resiliently deformable portion **38** that is circumscribed by a rigid portion **40**. The deformable portion **38** includes a plurality of circumferentially spaced nodules **42**. As shown in FIG. **4**, the nodules **42** are configured to be compressed by the mounting cap **26** as necessary and function as a tolerancing mechanism to ensure a good fit of the deformable portion **38** between the lip **32** and the shoulders **36**.

Turning now to FIGS. **8** and **9**, a machine **100** constructed in accordance with a first preferred embodiment of the present invention is shown. The machine **100** includes a motor **102**. The motor **102** includes a rotor **104** having a rotor shaft **106** that is rotatable about an axis. The rotor shaft **106** is particularly suited to support a belt sheave (not shown), although such an arrangement is not required. The motor **102** also includes a stator (not shown) preferably positioned radially outside the rotor **104**. It is within the scope of some aspects of the present invention, however, for the motor to be of an outer rotor type, with the rotor positioned radially outside of the stator, or to be a dual rotor motor having a first rotor positioned radially inside of the stator and a second rotor positioned radially outside of the stator. Any of a variety of other motor configurations are permissible, as well.

Like the prior art machine **10** of FIGS. **1-7**, the machine **100** of the first preferred embodiment may suitably be any one of a variety of types, including but not limited to clothes dryers. Furthermore, as for the prior art machine **10**, the machine **100** of the first preferred embodiment preferably includes substantially similar halves or portions and will be both discussed and illustrated with reference to only one of such halves. It should be understood, however, that it is permissible for one or more additional components similar to or identical to those described below to be present in the machine **100** of the first preferred embodiment.

As best shown in FIG. **11**, the motor **102** preferably includes a motor frame **108** including a bearing hub **110** and a plurality of arcuately spaced apart, generally radially extending arms **112** that extend from the bearing hub **110** and support the stator. The bearing hub **110** preferably supports a bearing **114** (FIG. **10**) that rotatably supports the rotor shaft **106**. Any one or more of a variety of bearing types, including ball bearings, are suitable for use with the present invention.

Preferably, the bearing hub **110** includes wall structure **116** that presents a bearing-engaging surface **118** spaced radially inwardly from a ring-engaging surface **120**. The ring-engaging surface **120** will be discussed in greater detail below.

The motor **102** preferably includes a mounting ring **122**. The mounting ring **122** is preferably circular and annular in form, although it is within the scope of some aspects of the present invention for the ring to take any of a variety of forms. For instance, the mounting ring could be a disc lacking an opening therethrough, or the mounting ring could be annular but have varying inner and outer perimeter shapes. The outer perimeter might be rectangular, for instance, while the inner perimeter might be circular.

As shown in FIGS. **12**, **13**, and others, the mounting ring **122** preferably includes a resiliently deformable portion **124** and a rigid portion **126** that at least substantially circumscribes the deformable portion **124**. In a preferred embodiment, the deformable portion **124** comprises rubber, and the rigid portion **126** comprises a hard plastic that is preferably overmolded over the rubber deformable portion **124**. However, any one or more of a variety of materials may be used without departing from the scope of the present invention. It is also permissible within the scope of some aspects of the present invention for the mounting ring to include a single rigid or deformable portion or to include more portions than the two preferred portions described above. Even further, it is within the scope of some aspects of the present invention for the deformable portion to circumscribe the rigid portion.

As shown in FIG. **10** and others, the mounting ring **122** preferably circumscribes the corresponding ring-engaging surface **120** of the wall structure **116** such that the deformable portion **124** contacts the ring-engaging surface **120** and is preferably resiliently compressed between the rigid portion **126** and the ring-engaging surface **120**. This arrangement will be discussed in greater detail below.

In an alternative embodiment in which the deformable portion **124** circumscribes the rigid portion **126**, it is permissible for the ring-engaging surface **120** to instead circumscribe the mounting ring **122**. That is, an arrangement that is essentially an inversion of the preferred configuration is allowable.

The rotor shaft **106** preferably passes through the center of each mounting ring **122** and is rotatable relative thereto while supported on the bearing **114**. It is permissible, however, for an alternative shaft arrangement to be used. For instance, the shaft might be oriented in such a manner that the mounting ring center does not lie on the axis of the shaft (e.g., the shaft might be oriented perpendicularly to the mounting ring central axis), or the shaft might include an offset section that passes outside the mounting ring.

With regard to the bearing, it is within the scope of the present invention for the center of the mounting ring to be positioned in axial alignment with the center of the bearing or to be offset. It is also permissible for the mounting ring to be positioned radially outside, radially inside, or in part radially

inside and in part radially outside the bearing. In some configurations, the mounting ring might be positioned orthogonally to the bearing or at some other angle to the bearing. Furthermore, the mounting ring and bearing should not be limited to longitudinal alignment. That is, the mounting ring may be shifted in an axial direction relative to the bearing.

Preferably, a shield **128** is attached to the rotor shaft **106** and provides a physical barrier against encroachment of dust or other debris into the motor **102**. However, any suitable dust or debris barrier may be applied without departing from the scope of the present invention, or such a barrier may be excluded entirely.

The machine **100** preferably includes a motor support **130** with a ring-receiving opening **132** (FIG. **11**). The mounting ring **122** is secured in the ring-receiving opening **132** and supports the motor **102** in the machine **100**. In a preferred embodiment, the motor support **130** includes strap-receiving projections **134**. A strap **136** is attached to the support **130** at the strap-receiving projections **134** and extends around a portion of the mounting ring **122** to further secure the mounting ring **122** and motor **102** in the machine **100**. More particularly, as best shown in FIGS. **6** and **7**, the rigid portion **126** of the mounting ring **122** preferably includes a plurality of circumferentially spaced apart, axially staggered strap guides **138** defining a pathway **140** therebetween. The strap **136** extends from a first of the strap-receiving projections **134** and along the pathway **140** to a second of the strap-receiving projections **134**.

Turning to FIGS. **10**, **11**, and **14**, the wall structure **116** includes a catch **142** comprising a plurality of circumferentially spaced apart, radially extending catch projections **144**. It is permissible, however, for a single catch projection to be provided and to extend arcuately about only a portion of the wall structure or to completely circumscribe the wall structure. Preferably, each of the catch projections **144** defines a flat surface **146** spaced axially from a sloped surface **148**.

The wall structure **116** also preferably includes a plurality of first radially extending faces **150** and second radially extending faces **152** arcuately spaced from the corresponding first faces **150**. The corresponding first and second faces **150**,**152** preferably define a groove **154** therebetween. Preferably, the catch projections **144** extend between corresponding faces **150**,**152** so as to span the corresponding groove **154**. It is permissible, however, for the catch projections **144** to span only partway across the groove **154** or to extend beyond one or both of the faces **150**,**152**.

As shown in FIG. **14** and others, the deformable portion **124** of the mounting ring **122** preferably includes a plurality of ribs **156** corresponding to the grooves **154**. The ribs **156** are preferably separated by arcuately extending spaces. The deformable portion **124** also preferably includes locking surfaces **160** (best shown in FIGS. **9**, **11**, and **12**) corresponding to the catch projections **144**. Although multiple discrete locking surfaces are preferred, a single locking surface may be provided without departing from the scope of the present invention and would most suitably correspond to an alternative embodiment utilizing a single catch projection.

For assembly of the mounting ring **122** onto the frame **108**, the mounting ring **122** is initially positioned as shown in FIGS. **11** and **14**, with the ribs **156** of the mounting ring **122** arcuately aligned with corresponding grooves **154**. The mounting ring **122** is then moved in a first axial direction toward the frame **108**. The ribs **156** of the deformable portion **124** of the mounting ring **122** then engage the sloped surfaces **148** of the catch projections **144** and are resiliently compressed by the catch projections **144** upon continued application of a force in the first axial direction. The deformation is eventually such that the deformable portion **124** and, in turn, the mounting ring **122** as a whole passes by the sloped surfaces **148** and catch projections **144**. The ribs **156** are then received in the grooves **154**, as shown in FIGS. **8-10**.

In a preferred embodiment, each of the first faces **150** includes a radially extending shoulder **162** (FIGS. **11** and **14**). The shoulders **162** block further axial movement of the mounting ring **122** in the first direction. Axial movement of the mounting ring **122** relative to the frame **108** in a second axial direction opposite the first axial direction (i.e., movement toward separation of the mounting ring **122** from the frame **108**) is blocked by engagement of the locking surfaces **160** by the catch projections **144**. Twisting of the mounting ring **122** relative to the frame **108** is blocked by engagement of the first and second faces **150**,**152** with the corresponding ribs **156**.

In a preferred embodiment, the deformable portion **124** of the mounting ring **122** is radially compressed between the rigid portion **126** and the ring-engaging surface **120** such that twisting is also inhibited by friction.

It is noted that the rib-and-groove configuration described above is particularly useful for preventing or restricting relative rotation between the mounting ring and the frame. However, alternative configurations may be used to similar effect without departing from the scope of the present invention. For instance, complementary holes and posts could be provided on respective ones of the mounting ring and the frame.

In the preferred manner described above, the mounting ring **122** is secured on the frame **108** through means of wall structure **116** that is integrally formed with the frame **108**. It is permissible within the scope of some aspects of the present invention, however, for various modifications to the preferred embodiment described above to be implemented. For instance, components of the wall structure or even the wall structure in its entirety might be non-integral with the frame. The shoulders could be formed on the second faces or entirely independently from the faces, or alternate structure to prevent axial motion in the first axial direction might be provided. As briefly noted above, the mounting components in general could be largely inverted to accommodate a mounting ring having a radially outer deformable portion and a radially inner rigid portion. Furthermore, it is permissible for the locking surfaces to be defined by both the deformable portion and the rigid portion or to be defined by the rigid portion alone.

The structure described above enables numerous advantages. For instance, provision of wall structure **116** that engages the mounting ring **122** enables the mounting ring **122** to be secured on the motor frame **108** without use of an additional component such as a mounting cap, thus reducing both the total cost of the motor **102** and the time required for mounting of the motor **102** in the machine **100**.

Turning now to FIGS. **15-22**, a second preferred embodiment of the present invention is illustrated. It is initially noted that, with certain exceptions to be discussed in detail below, many of the elements of the machine **200** of the second embodiment are the same as or very similar to those described in detail above in relation to the machine **100** of the first embodiment. Therefore, for the sake of brevity and clarity, redundant descriptions and numbering will be generally avoided here. Unless otherwise specified, the detailed descriptions of the elements presented above with respect to the first embodiment should therefore be understood to apply to the second embodiment, as well.

The machine **200** of the second preferred embodiment includes a motor **202** including a frame **204** that presents a bearing hub **206**. The frame **204** (and, more preferably, the

bearing hub **206** of the frame **204**) preferably includes wall structure **208** that defines a ring-engaging surface **210**. The wall structure **208** also includes a catch **212** preferably comprising a plurality of circumferentially spaced apart, radially extending proximal catch projections **214** and a plurality circumferentially spaced apart, radially extending distal catch projections **216** spaced axially from the proximal catch projections **214**.

As best shown in FIGS. **18** and **19**, the wall structure **208** defines a plurality of rib-receiving slots **218**, each of which is arcuately adjacent a corresponding groove **220**. More particularly, a plurality of radially extending faces **22** extend from the ring-engaging surface **210** and each define one arcuate side of a corresponding groove **220**. The other arcuate side of each groove **220** is open so as to be in communication with a corresponding one of the rib-receiving slots **218**. Preferably, the grooves **220** are shallow in comparison to the rib-receiving slots **218**. As shown in FIGS. **18-20**, for instance, the radially innermost boundary of each groove **220** is defined by a platform **224** that projects radially outwardly relative to a surface **226** that defines the radially innermost boundary of each rib-receiving slot **218**.

Preferably, one of the distal catch projections **214** extends radially outwardly and in a first arcuate direction from each of the faces **222** so as to extend at least partially across the corresponding groove **220**. Furthermore, one of the proximal catch projections **216** preferably extends radially outwardly from each of the faces **22** in a second arcuate direction opposite the first arcuate direction, so as to extend at least partially across the adjacent rib-receiving slot **218**.

As shown in FIG. **18** and others, the motor **202** preferably includes a mounting ring **228** including a deformable portion **230** and a rigid portion **232** that preferably circumscribes the deformable portion **230**. The deformable portion **230** preferably includes a plurality of ribs **232** corresponding to the grooves **220**. The ribs **232** are preferably separated by arcuately extending spaces **236**. The deformable portion **230** also preferably includes locking surfaces **238** (best shown in FIGS. **16**, **18**, and **21**) corresponding to the distal catch projections **214**.

For assembly of the mounting ring **228** onto the frame **204**, the mounting ring **228** is initially positioned as shown in FIGS. **18** and **19**, with the ribs **232** of the mounting ring **228** arcuately aligned with corresponding rib-receiving slots **218**. The mounting ring **228** is then moved in a first axial direction toward the frame **204** such that the ribs **232** of the mounting ring **228** are inserted into corresponding rib-receiving slots **218**. The spaces **236** between the ribs **234** are preferably expansive enough to allow to the mounting ring **228** to pass unobstructed over the corresponding face **222** and platform **224** during the axial movement. As shown in FIG. **20**, the deformable portion **230** then comes into contact with the proximal catch projections **214**, which block further axial movement of the mounting ring **228** in the first direction. As shown in FIG. **21**, the locking surfaces **238** and the distal catch projections **214** are alternately arcuately arranged after the completion of the axial motion in the first direction.

The mounting ring **228** is then twisted relative to the frame **204** in a circumferential or arcuate direction (as indicated by an arrow in FIG. **22**) such that each rib **234** is received in the corresponding groove **220** and is preferably radially compressed between the rigid portion **232** of the mounting ring **228** and the corresponding platform **224** of the wall structure **208**. Such compression serves to restrict untwisting of the mounting ring **228** relative to the frame **204**.

It is permissible, however, for other or additional means of preventing untwisting to be provided. For instance, a plurality of arcuately spaced apart, axially extending stops might be provided for engagement with the edges of the ribs adjacent the respective open arcuate side of each groove. These stops could include a sloped surface to allow traverse via twisting in one direction and a flat, radially extending surface to prevent traverse via twisting in the other direction. The stops could be separate from or integral with the frame. The stops could be immovable or be configured to be put into position (e.g., by pivoting, snapping into place, or arcuate or radial sliding or translation) only after the mounting ring has been twisted into place. Stopping means could be provided on or be inherent to other parts of the machine, motor, or frame as well. For instance, openings provided in the arcuately spaced apart arms could be utilized. Ultimately, it is within the scope of the present invention for any of a variety of physical stop mechanisms, including mechanisms not described above, to be used to prevent untwisting of the mounting ring from the frame.

It should be noted that provision or use of physical stops such as those described above allows for elimination of compression as a means of preventing untwisting, although it is permissible for compression to be used in addition to stops or other physical obstructions.

Axial movement of the mounting ring **228** relative to the frame **204** in a second axial direction opposite the first axial direction (i.e., movement toward separation of the mounting ring **228** from the frame **204**) is blocked by engagement of the locking surfaces **238** by the distal catch projections **214**. Further twisting of the mounting ring **228** relative to the frame **204** in the indicated direction is blocked by engagement of the faces **222** with the corresponding ribs **234**.

As will be readily apparent to one skilled in the art, the direction of twist for securing the mounting ring **228** onto the frame **204** will be dependent on the direction of the torques that will be applied by the motor **202** during operation of the machine **200**. Furthermore, with reference to a motor having a similar or identical mounting ring at each of its axial end, it is understood that the twist directions may preferably be opposite one another.

It is noted that the rib-and-groove configuration described above is particularly useful for preventing or restricting relative rotation between the mounting ring and the frame. However, alternative configurations may be used to similar effect without departing from the scope of the present invention. For instance, complementary holes and posts could be provided on respective ones of the mounting ring and the frame.

In the preferred manner described above, the mounting ring **228** is secured on the frame **204** through means of wall structure **208** that is integrally formed with the frame **204**. It is permissible within the scope of some aspects of the present invention, however, for various modification to the preferred embodiment described above to be implemented. For instance, components of the wall structure or even the wall structure in its entirety might be non-integral with the frame. As briefly noted above, the mounting components in general could be largely inverted to accommodate a mounting ring having a radially outer deformable portion and a radially inner rigid portion. Furthermore, it is permissible for the locking surfaces to be defined by both the deformable portion and the rigid portion or to be defined by the rigid portion alone.

The structure described above enables numerous advantages. For instance, provision of wall structure **208** that engages the mounting ring **228** enables the mounting ring **228** to be secured on the motor frame **204** without use of an additional component such as a mounting cap, thus reducing both the total cost of the motor **202** and the time required for mounting of the motor **202** in the machine **200**.

Although the above description presents features of preferred embodiments of the present invention, other preferred embodiments may also be created in keeping with the principles of the invention. Furthermore, as noted previously, these other preferred embodiments may in some instances be realized through a combination of features compatible for use together despite having been presented independently as part of separate embodiments in the above description.

The preferred forms of the invention described above are to be used as illustration only and should not be utilized in a limiting sense in interpreting the scope of the present invention. Obvious modifications to the exemplary embodiments, as hereinabove set forth, could be readily made by those skilled in the art without departing from the spirit of the present invention.

The inventors hereby state their intent to rely on the Doctrine of Equivalents to determine and access the reasonably fair scope of the present invention as pertains to any apparatus not materially departing from but outside the literal scope of the invention set forth in the following claims.

What is claimed is:

1. A motor for a machine, wherein the motor includes a motor support with a ring-receiving opening, said motor comprising:

a rotor;

a stator;

a mounting ring configured to be secured in the ring-receiving opening of the motor support,

said mounting ring including a resiliently deformable portion configured to dampen relative motion between the motor and the machine,

said mounting ring including a locking surface; and

a motor frame operably supporting the rotor and stator,

said motor frame being interconnected with the mounting ring and thereby supported on the motor support,

said motor frame including an integral catch engaging the locking surface to at least substantially block separation of the mounting ring from the motor frame.

2. The motor as claimed in claim **1**,

said mounting ring moving along a first direction during interconnection with the motor frame, with engagement of the catch and locking surface restricting relative movement of the mounting ring in an opposite second direction.

3. The motor as claimed in claim **2**,

said rotor including a rotor shaft rotatable about a rotor axis,

said first and second directions being opposite axial directions.

4. The motor as claimed in claim **3**,

said motor further including a bearing supported by the motor frame,

said bearing rotatably supporting the rotor shaft.

5. The motor as claimed in claim **4**,

said motor frame including a bearing hub that supports the bearing and thereby the rotor shaft,

said bearing hub including wall structure that presents a bearing-engaging surface and a ring-engaging surface,

said catch projecting relative to the ring-engaging surface.

6. The motor as claimed in claim **5**,

said motor frame including a plurality of arms extending at least substantially radially from the bearing hub,

said arms supporting the stator.

7. The motor as claimed in claim **5**,

said bearing-engaging and ring-engaging surfaces extending along the rotor axis,

said rotor shaft extending through the motor frame and mounting ring,

said bearing-engaging surface being spaced inwardly from the ring-engaging surface, such that the mounting ring circumscribes at least a portion of the bearing hub,

said catch projecting radially outward relative to the ring-engaging surface.

8. The motor as claimed in claim **7**,

said catch including a plurality of projections spaced circumferentially about the ring-engaging surface.

9. The motor as claimed in claim **7**,

said deformable portion of the mounting ring being substantially annular,

said mounting ring including a relatively rigid portion that at least substantially circumscribes the deformable portion,

said deformable portion being resiliently compressed between the ring-engaging surface and the rigid portion.

10. The motor as claimed in claim **9**,

said deformable portion comprising rubber,

said rigid portion comprising a hard plastic.

11. The motor as claimed in claim **9**,

said locking surface being defined by the deformable portion.

12. The motor as claimed in claim **7**,

said ring-engaging surface and mounting ring including a complemental rib-and-groove connection.

13. The motor as claimed in claim **12**,

said catch being arcuately aligned with the rib-and-groove connection, with the ring-engaging surface including the groove and the mounting ring including the rib.

14. The motor as claimed in claim **13**,

said ring-engaging surface including arcuately spaced, radially extending faces between which the groove is defined,

said deformable portion of the mounting ring defining the rib,

said rib being resiliently compressed by the catch as the mounting ring is moved along the first direction during interconnection with the motor frame.

15. The motor as claimed in claim **13**,

said ring-engaging surface including a radially extending face defining one arcuate side of the groove, with the other arcuate side of the groove being open,

said ring-engaging surface including an axially extending rib-receiving slot communicating with the open side of the groove, such that the rib is shifted axially along the slot as the mounting ring is moved along the first direction and the rib is then rotated into the groove once axially aligned therewith to interconnect the mounting ring and motor frame.

16. The motor as claimed in claim **3**,

said motor frame and mounting ring including a complemental rib-and-groove connection.

17. The motor as claimed in claim **16**,

said catch being arcuately aligned with the rib-and-groove connection, with the motor frame including the groove and the mounting ring including the rib.

18. The motor as claimed in claim **17**,

said motor frame including arcuately spaced, radially extending faces between which the groove is defined,

said deformable portion of the mounting ring defining the rib,

said rib being resiliently compressed by the catch as the mounting ring is moved along the first direction during mounting interconnection with the motor frame.

19. The motor as claimed in claim 17,

said motor frame including a radially extending face defining one arcuate side of the groove, with the other arcuate side of the groove being open,

said motor frame including an axially extending rib-receiving slot communicating with the open side of the groove, such that the rib is shifted axially along the slot as the mounting ring is moved along the first direction and the rib is then rotated into the groove once axially aligned therewith to interconnect the mounting ring and motor frame.

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